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FLIGHT
and
AIRCRAFT ENGINEER

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Luftwaffe Slaughter

THE many attacks by Allied air power on German oil have now borne amazing fruit. It appears that the bombing of German aircraft factories was less conclusive, for a recent estimate credited the *Luftwaffe* with 4,000 aircraft of all sorts. But what is the use of aircraft which cannot fly?

April 16th was a disastrous day for the *Luftwaffe*. The long-range fighter-bombers of the British and Americans swept across the unoccupied parts of Germany and attacked the airfields. They destroyed over 1,000 enemy machines on the ground, and damaged another 700. The victims were helpless, and were slaughtered at will. Without fuel they could not take off. In fact, they were so helpless that one almost wonders whether the effort of destroying them was worth while.

At the same time Marshal Malinovsky captured the Austrian centre of Zisterdorf, the last source of natural oil left in German hands. It had been extensively developed during the course of the war; but now it will provide no more fuel for enemy aircraft or armoured fighting vehicles.

Recently some scrappy news has been coming through to the effect that the *Luftwaffe* has been showing up at various places in resistance to the Russian advance. It has not been so on the West Front. A bad conscience, a knowledge of the enormities which German troops have perpetrated during their occupation of Poland and of considerable tracts of Russia, may well have prompted a sterner defensive effort with the last forces at the German command on the East rather than on the West Front. But a German broadcaster has proclaimed that there is now no distinction between the two fronts; both are aiming at Berlin. It is significant that British long-range fighters on a mission should have met Russian Stormoviks in the air, and that the two forces should have saluted each other. It may not be long before the ground forces also meet.

It seems, too, that the persistent attacks from the West on airfields used by German jet-propelled fighters have been effective. The enemy evidently looked on these novelties as his last chance in the air. Now, without doubt, he has no chance at all.

Stalling

WHEN flying was in its infancy, and flying machines were very under-powered, it was soon discovered that there was very little range between maximum speed and minimum speed. In fact, while the Gnome rotary engine was the popular type, one could hardly talk of speed range because the engine had no throttle. Either it ran all-out or it stopped, except for the small degree of power control obtainable with the "blip switch," which was not very much.

Then came the le Rhone rotary and various in-line types of engine, which did have proper throttle control, and if the power available was sufficient, it became possible to fly throttled down. During both those stages, loss of flying speed (we did not then call it stalling) was the thing to be dreaded, and, owing to the low engine powers available, this nearly always happened on a climb.

Engine power, aircraft speeds and manœuvrability continued to increase, and we then ran into yet another phase: the high-speed stall, which could cause spins from which recovery was impossible if the height was insufficient. In this issue we publish an article on the basic causes of this type of stall, which usually occurs during a turn. If it takes place when a pilot is "show-

ing-off" near the ground, the result may well be fatal.

All this leads to the thought that perhaps the stall indicator ought to be revived. Our good friends in America appear to think so. The Civil Aeronautics Authority has sponsored a development programme, and one scheme, the C.A.A.-Gurley, is well advanced and likely to be on the market soon. It is based on the simple vane which was used in the British Savage-Bramson anti-stall gear produced in this country soon after the first world war, but is reduced to the simple function of merely giving visual and aural warning. Mr. Bramson's invention went much farther in that it *prevented* the stall by automatically operating the elevator control when the angle of incidence of the wing reached a predetermined value.

Aircraft or Battleships?

RECENT events have made it inevitable that comparisons should be drawn between the effectiveness of seaborne and airborne weapons of war. No one would suggest that air power has completely replaced sea power, any more than that it has rendered armies superfluous. A correspondent takes us to task for our editorial comment in the April 12th issue. We have read that comment again, and it appears to us that our correspondent has quite missed the point, which was merely that the R.A.F. has, by its work in this war, earned the right to be treated as the equal of the other two Services, and that it must never again be starved of funds while the Navy is allowed to spend millions on battleships.

The "stale and outmoded controversy," which our correspondent accuses us of having revived, has, we think he will agree, been rendered rather less outmoded through the sinking, since he wrote his letter, of the German battleship *Admiral Scheer* and, more recently, the *Lützow*, formerly the *Deutschland*.

These recent sinkings have occurred while the vessels were stationary. In his review of the situation Lt. Cdr. Hurren surveys the history and actual events of the bomb versus battleship controversy, which include both "stationary" and "moving" sinkings.

Lt. Cdr. Hurren refers to the airborne torpedo as "by far the most dangerous of all present naval weapons." We assume that this is not to be taken as an indication that he belittles the value of the new 12,000 lb. and 22,000 lb. bombs, but that these are R.A.F. and not naval weapons. It appears obvious that torpedoes could not have been used in the recent attacks on Kiel and Swinemünde, and that therefore the heavy bomb also has an important part to play. The main thing is that it has been amply proved that aircraft *can* sink battleships, and for losses in men and aircraft which are relatively insignificant. Moreover, the limits of the battleship are within sight. Aircraft destructive power is only just beginning.

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AN R.A.F. HELICOPTER BRANCH: The Royal Air Force now has a school for training helicopter pilots. Here an instructor is seen giving a demonstration on a Sikorsky R4B of an evolution which is not recommended for beginners. Other pictures issued show five of these machines flying in echelon. Presumably that proves their manoeuvrability and that they can be flown accurately. The same may be said of the evolution in this photograph, but apart from the skill required in piloting, a serious drawback is the high sinking speed when the rotor is autorotating

WAR in the AIR

Heligoland Bombed: End of the Dim-out : Hitler's Redoubt? : Japanese Kamikage Pilots

MATELOTS' MOKE : Daisy, a local donkey, pulls the dispersals' bus at a Royal Naval Air Station in Ceylon.

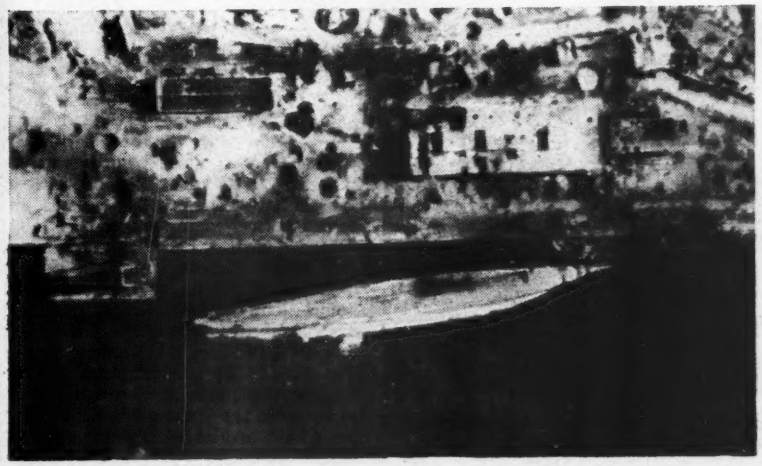
IN the first world war a great deal was heard about Heligoland. It was a convenient advanced base for the powerful German High Seas Fleet. The elderly ones among us can remember when it was a British possession, and how the great Lord Salisbury was criticised for giving it back to Germany in exchange for some territory in Africa in 1890. We remember a cartoon in *Punch* which accused Lord Salisbury of having given it away "with a pound of tea."

In the present war little has so far been heard of Heligoland, as the Germans have not possessed a fleet which could challenge the Home Fleet of the Royal Navy to a pitched battle. But as the war neared its close, the R.A.F. last week sent out nearly 1,000 bombers with an escort of Spitfires and Mustangs to raid it. The raid was in all probability an anti-submarine measure. Mr. Forrestal, the Secretary for the U.S. Navy, had remarked only a day or two before, that the submarine threat to the sea connections between Great Britain and the Continent had become serious. Of course, the Admiralty and the H.Q. of Coastal Command were not in ignorance of the situation, and action would no doubt have been taken just the same even if Mr. Forrestal had said nothing.

Under the treaty of Versailles the fortifications of Heligoland had been dismantled; but during the present war (or perhaps before) they had been replaced. In addition to the guns, there were shelters for E-boats, R-boats, and U-boats. On the smaller island of Düne, three-quarters of a mile away, there is an airfield. In very clear daylight the bombers set about their job, and kept at it for more than an hour. Great fires were set going, and the operation was carried out without the loss of any of our aircraft. The attack has been repeated.

Another useful piece of work by the R.A.F. was the bombing by Lancasters of the railway yards at Cham, east of Nuremberg, through which arms from the Skoda works in Czechoslovakia were railed to the German front. Again we suffered no loss.

The Eighth and Fifth Armies in Italy are now making a great push to



BOTTOMS UP : The German battleship *Admiral Scheer* lying upside down in Kiel dockyard after an attack by Bomber Command. It looks uncommonly like the *Tirpitz* looked after Bomber Command had turned her over in a Norwegian fjord.

WAR IN THE AIR

wipe out the formidable German force which still confronts them. They have been receiving strong air support, while the Germans must be to all intents and purposes devoid of such help. The German divisions left in Italy are strong and good, and they, like our own men, have had a period of rest with little heavy fighting. But rest means one thing to the side which has air superiority, and it may not mean very much to troops who get harried from the air by night as well as day, and whose communications are constantly interfered with.

The End of a Chapter

THE complete elimination of the Ruhr pocket by the Americans ends a chapter in the history of independent air operations. Bomber Command fought a great and heroic battle to check the production of munitions of war in the Ruhr cities. The losses in aircrews were tragic, but the sacrifice saved many lives of soldiers once the Allied advance began. At the end the air attacks on Ruhr cities were aimed at communications rather than at production. In this way Bomber Command gave an example of its flexibility. Probably the Command was most pleased with itself when undertaking what is called strategic bombing, for then it was making a contribution to victory which neither of the other Services could make; but when the time came to switch over to tactical bombing in support of the ground troops, Bomber Command was quick to show that it was not merely capable of thinking along one track. Trained as it was for night bombing, it readily adapted itself to daylight operations. Now, at last, the need for air attacks on the Ruhr is over, and the relief is great. The remaining inhabitants of the cities will surely agree with us there.

THE LUFTWAFFE DIES: Wrecked aircraft found on the airfield at Celle when captured by the 15th Scottish Division. In the foreground are the remains of a Ju 88G with Ju 87s in the background.

We have been hearing stories about the preparations which the Germans are supposed to be making for holding out, in the manner of Hereward the Wake, in a "redoubt" in the mountains of southern Germany after their last regular Army has suffered its Battle of Hastings. It sounds rather fantastic; but observers in the air have seen supplies being moved by train and road in the direction of the mountains. The other day the railway yards at Ulm were found to be crowded with supply trains southward bound. The U.S. 9th Air Force attacked the yards, and doubtless diminished the bulk of the supplies.

BARRACKING: South African Air Force Beaufighters of the Balkan Air Force attacking enemy barracks at Postumia near Trieste. Using rockets, 84 hits were scored.

The finality of the defeat of the *Luftwaffe* was marked by the decision of the Ministry of Home Security to abolish finally the dim-out on Monday, April 23rd. It is to be retained for the present along the coast; but that exception was made at the request of the Admiralty, in case the lights should help U-boats to find their position, not because further air raids are expected. We should be wise not to conclude that there is no more chance of V-bombs arriving in Great Britain; but they cannot see, and darkness and light to them are both alike. The black-out was a precaution against accurate aiming of bombs from piloted aircraft, and there is little chance of further raids by them. Even if a few machines do make a last despairing effort to kill a few more Britons, the chances of damage are so small that it is no longer worth while to put the people of this country to the inconvenience of darkening their streets. Factories in particular will benefit from the freedom of blacking-out or dimming-out at night.

Berlin's Plight

LAST week the Russians started their advance across the River Oder against Berlin, and regularly every night Mosquitoes visit the Prussian Capital and add to the destruction there. General Eisenhower has wisely declined to discuss the capture of Berlin, saying that he is not interested in geography, but is concerned with the destruction of the enemy fighting forces. But it looks as if Berlin will be occupied before long by the Allies; and the Americans are not much farther off in the West than the Russians are in the East. The inhabitants of the Capital will probably share the relief of those in the Ruhr when occupation by Allied armies ends the period of nightly bombing raids. Hitler's birth-

CAPTURED INTACT: A jet-propelled Me 262 fighter found on an airfield near Frankfurt. It is credited with a speed of about 500 m.p.h. and 475 gallons of fuel can be carried. Four 30 mm. cannon and two 250 kilogram bombs constitute the offensive armament. It has a tricycle undercarriage. Two Junkers Jumo 004 turbine-jet units are on the ground.

WAR IN THE AIR

day this year was no occasion for jubilation in the *Reich*, though Dr. Göbbels' broadcast recalls the lines of Lewis Carrol:—

> The Snark, though a little aghast,
> As the lawyer to whom the defence was entrusted,
> Went bellowing on to the last.

Hitler's birthday was speedily followed by the arrival of Russian shells in the centre of Berlin. Masses of Russian and German aircraft were soon in continual combat over the city; but the *Luftwaffe* evidently failed in what has always been the first duty of an Air Force ever since the Retreat from Mons, namely, the provision of information about the enemy's movements. The Germans were taken by surprise, so correspondents report, by finding that Marshal Zhukov's armour and guns were attacking from unexpected directions.

On Friday, April 20th, Bomber Command Mosquitoes made six raids in the night on the Reich Capital. It may not be necessary for them to go there again, for the Red Air Force and the formidable Russian artillery have the matter in hand.

Berlin was occupied by Napoleon's troops after the battle of Jena. Since then the idea of an enemy Army reaching its outskirts has never occurred to the mind of any German—least of all to that of Adolf Hitler. But . . .

Bologna was a prize which eluded the grasp of the 8th and 5th Armies all through the winter; but by the time these words are published its fall will read like ancient history. As the Germans retreated across the River Po the full power of the Tactical Air Force was turned on to them, and everyone can picture for himself that the results were devastating to the enemy.

The liberation of Danzig by the Russians played nicely into the hands of the Royal Air Force. The sinking of the *Admiral Scheer* at Kiel has already been recorded. Then, on the afternoon of April 16th, a small force of Lancasters flew to Swinemünde, where the *Lutzow* had been discovered, and dropped 12,000 lb. bombs. Evidently ten-tonners were not considered necessary, and certainly the ones used did their work well enough. One fell beside a quay 60 feet away from the pocket battleship, which thereupon sank to the bottom without capsizing. Her plates must have been burst open by what has sometimes been called the water hammer. There will be no imposing German fleet to surrender as in 1918.

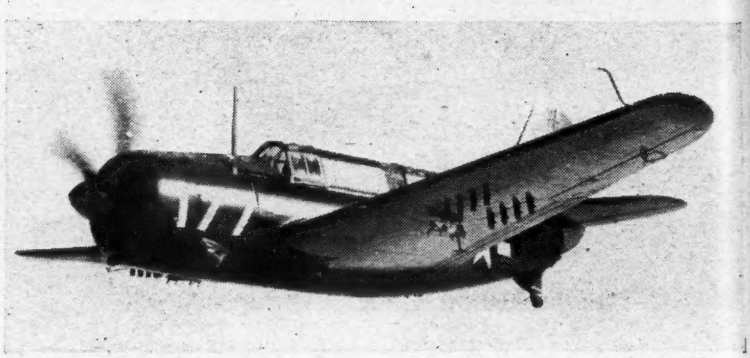
SWALLOW'S URGE: The starboard Junkers Jumo 004 turbine-jet unit of the Messerschmitt 262 (Swallow) fighter. It has a multi-stage compressor and a two-stage turbine.

Suicide Airmen

AS for the war against the Japanese, it is hard to keep count of the number of air raids on the Tokyo area and on Formosa and the islands round it. The Japanese seem to think that a soldier or airman who does *not* live to fight another day is a more useful person than one who does. Death, rather than victory, seems to be their ideal. So they organised an air corps called the "Divine Wind" to attack the Allied warships. It consisted of high-class pilots who were prepared to dive and crash their machines on to the decks of Allied vessels. It was evidently regarded as a sort of religious sacrifice, and the pilots dressed themselves for it in flowing silk robes, which must have been highly inconvenient in an aircraft. Then another corps was formed, called the Kamikaze Corps, which had the same object, but dispensed with the silk robes. According to latest reports, these men were conscripts and not very skilful. Off Okinawa they succeeded in sinking 15 ships, the largest of which was a destroyer; but did nothing to affect the naval superiority of the Allies in those waters. One British ship was slightly damaged, but none was sunk. However, the suicide of the pilots came off all right, and the number of aircraft destroyed rose to figures which the Japanese Air Force can certainly not afford to lose.

In Burma R.A.F. Liberators severely damaged the power plant at Bangkok with eighty bombs of 100 lb. calibre.

HERE AND THERE



"DASH FOUR"—or alternatively, "the Beast," is the latest version of the Curtiss Helldiver, the SB2C-4, whose striking power has been very considerably increased over that of the SB2C-3. It is armed with two 20 mm. cannon, eight rockets and over 2,000 lb. in bombs. "Swiss cheese" dive brakes are fitted.

U.S. Aircraft Output

A TOTAL of 7,053 aircraft were built in America during March, it was announced by the U.S. War Production Board. Of these, 2,544 were bombers.

Forecast

THE U.S. Assistant Secretary of Commerce, Mr. A. M. Burden, recently told the Boston Aeronautical Association that within the next ten years there would be 400,000 privately owned aircraft flying in America.

A.T.C. "Star" Cadets' New Badge

A.T.C. Cadets who have passed the "advanced training" examination will in future wear a special distinguishing badge—a four-pointed star on the left sleeve just above the "proficiency" propeller badge.

Congratulations

EVERYONE was delighted to hear of the rescue of Wing Cdr. Douglas Bader, D.S.O. and bar, D.F.C. and bar, from a German prison camp last week.

Bader was forced to bail out over France in August, 1941, and one can well imagine what 3½ years' captivity must have meant to a man who, with two artificial legs, was yet able to argue his way back into a fighter's cockpit against official opposition.

New Midland A.T.C. Commandant

AIR VICE-MARSHAL W. B. CALLAWAY has been appointed Commandant of Midland Command, Air Training Corps, in succession to Grp. Capt. J. A. C. Wright, M.P., who is relinquishing this post at his own request.

Cool Customer

CHISLOV, the "ace" Soviet polar pilot, is reported by Reuter to have flown to within 180 miles of the North Pole during a reconnaissance raid.

Pravda is quoted by Reuter as saying that he spent 60 hr. in the air "without interruption."

Ambassadorial Speed

WHEN Sir Archibald Clark Kerr, British Ambassador in Moscow, and Mr. Averill Harriman, the U.S. Ambassador, flew together in a Liberator from Moscow to Washington last week, the flight was made in 49 hr. 20 min., which cut the previous best time for this trip by 7 hr.

Another Open Secret

IN the February issue of an American journal, *Automobile Topics*, is mention of a device which over here is still on the secret list. It is the Air Position Indicator, an instrument which enables the navigator of an aircraft to tell at a glance his air position in terms of degrees, minutes and seconds of latitude and longitude.

Aussie Mustangs

THE R.A.A.F. expects the first Australian-built Mustang to be ready next month. Tooling up for the production of this Anglo-American fighter—one of the most successful evolved during the war—began in Australia in February, and a long line of these aircraft has already been partly assembled. So far, Mustangs have not been used in the South-West Pacific.

In a Real Flap

A SUCCESSFUL flight in an ornithopter in which the designer-pilot is reported to have remained aloft for

GAS ATTACK—but only against the malaria-carrying mosquito. Two Hurricanes are spraying dichlor-diphenol-trichlor-ethane, the most effective anti-mosquito poison known, over ground in Burma to be occupied by Allied assault troops.

HERE AND THERE

several minutes and "gained altitude at will," after a launch by motor car tow, was described in the American journal, *Gliding*, recently, which said the gull wings moved through a 32in. arc and were operated by the pilot. The movement was conveyed to the wings by their supporting struts, which were linked to a lever in the cockpit.

As the craft was evidently built on sailplane lines, the possible presence of thermals cannot entirely be disregarded.

Jet Fuel Research

SHELL UNION has built and is now operating a laboratory for the study of fuels and lubricants suitable for use in jet-propulsion power-units, it is announced by the *Wall Street Journal*. This laboratory is at Wood River, Illinois.

New British Bomber

SIR ROY DOBSON, managing director of A. V. Roe and Co., recently disclosed that a new Avro bomber, bigger than the Lancaster, is being built primarily for attacks on Japan.

Like the Lancaster and the York, the new super-bomber will be named after a city in the north of England, but it is not permitted to publish even so much as its name at the time of writing.

In the Family Tradition

SQN. LDR. JOHN A. SOWREY, who has just been awarded the D.F.C., belongs to a family which has been "in the Service" since the old R.F.C. days of the last war. He is the eldest son of Air Comdre. J. Sowrey; his younger brother, P/O. J. A. F. Sowrey, was killed in action in North Africa in 1941, and his sister is serving in the W.A.A.F.

Furthermore, his uncles are Group Capt. F. Sowrey, who shot down the L.32 at Billericay in 1916, and Air Comdre. W. Sowrey, who commanded the Imperial Air Forces during the Abyssinian campaign, and his cousin (son of Group Capt. F. Sowrey) is Flt. Lt. F. B. Sowrey, now serving as an R.A.F. pilot.

Spain Slams the Door

LAST week Spain told the German embassy in Madrid that in future no German aircraft of any kind could land on Spanish territory, and her Government advised the British Government of this new order.

The decision was, of course, the result of Allied representations, because there can be little doubt that more than one Nazi thug had the idea of escaping with as much loot as possible via Spain, using the *Lufthansa* civil air service to Madrid, which had been maintained throughout the war till Spain suddenly slammed the door.

It may be pure chance that Spain's decision coincided with the release, by the Portuguese censors, of news of the arrival at Lisbon airport of three German civilians in a stolen bomber a fortnight previously, though it appears that the identity of these fugitives shows them to be only small fry. Evidently Sweden is also getting overcrowded with bad German navigators.

Signals Expert

AIR COMMODORE W. E. G. ("PEDRO") MANN, C.B.E., D.F.C., who was Chief Signals Officer under Air Chief Marshal Sir Arthur Tedder during the campaigns in the Western Desert, and who for the past year has been Senior Air Staff Officer to a home-based R.A.F. signals group, is leaving the R.A.F. to take charge of civil aviation signals in the Middle East. His headquarters will be at Cairo, and he will also be the personal representative of Lord Swinton.

Air Comdre. W. E. G. Mann, C.B.E., D.F.C

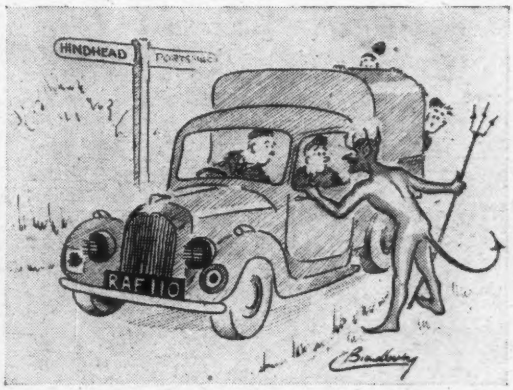
"Pedro" Mann joined the R.N.A.S. in 1917 and has continued in the R.A.F. since it was formed in 1918. He has held several important posts and received the U.S. Legion of Merit for his services with the Allied Forces during the North African and Sicilian landings, but he will perhaps be best remembered for his leadership of the first upside-down formation flight by the R.A.F. at Hendon Air Pageant, a spectacular display which he perfected while an instructor at the Central Flying School, then at Uphaven. "Pedro" Mann's flight, using Sopwith Snipes, gave flying displays all over the country in the early 1920s.

Apathy to Civil Aviation

AT the annual meeting of the Ae.E.A. recently held in Belfast, Mr. John G. Kennedy, in his presidential address, commented on the "apathy to civil aviation pervading in Northern Ireland in Government and other circles" which was necessitating the removal of the headquarters of the Association to England.

He pointed out that the Ae.E.A. was the first trade union in history to operate all over the United Kingdom from Belfast, but in view of the obvious advantages of the headquaters being where the bulk of the members lived, he felt sure no disadvantage would accrue from the change.

He hoped that in the years of progress which lay ahead, the Association would continue in its present policy of trying to contribute something from the workers' side to the progress of commercial aviation.



"I wonder if you could take me as far as the punchbowl."

Donner und Blister

THUNDERBOLTS of the 12th U.S. Air Force, it was officially disclosed last week, have for some time been using an aerial version of the flame-thrower in operations against the Germans.

This fearsome weapon is fitted in the "belly tank" position and scorches the earth over a path 150ft. wide and 250ft. long when the inflammable contents of the tank is released.

According to German prisoners' reports based on experience from the receiving end, it is a very effective morale-buster.

For Washington

AIR COMDRE. LESLIE MILLINGTON ILES, A.F.C., has been appointed to the British Air Commission at Washington as controller of technical services, with the acting rank of Air Vice-Marshal. He has been A.O.C. a group in India for the past three years, but he first joined the R.F.C. in 1917 and, since 1933, has been mainly engaged in engineering duties with the R.A.F., spending some two years at the School of Aeronautical Engineering.

U.S. Decorations for R.A.F.

SEVEN U.S. Distinguished Flying Crosses and ten U.S. Air Medals were awarded last week to R.A.F. aircrews who flew and supplied the Allied troops at Arnhem last September. The decorations were presented by Lt. Gen. Lewis Brereton, Commander of the 1st Allied Airborne Army.

Among the recipients of the D.F.C. was Flt. Lt. Lord Decies, who returned from the U.S.A. to join the R.A.F. and who was wounded during one of the nine sorties he made as an air gunner during the Arnhem operation.

King's Pilot Honoured

AIR COMDRE. E. H. FIELDEN, Captain of the King's Flight and His Majesty's pilot for the past 15 years, has been decorated with the *Croix de Guerre* by Gen. Joseph Pierre Koenig, Military Governor of Paris, in recognition of his services in flying secret missions to the French resistance movement during the German occupation of France.

With Air Comdre. Fielden, 11 other R.A.F. officers were similarly decorated. These were: Group Capt. K. S. Batchelow, Wing Cdrs. D. Speare, W. J. Burnett, J. C. Corby, R. W. J. Hooper and E. F. Ratcliff, Flt. Lts. F. Ashly and T. L. Buchanan, F/O. H. C. Brown, and P/Os. R. Rae and N. F. Ratcliff.

When presenting the awards Gen. Koenig said: "France will never forget this ceremony because you Englishmen played such brave parts in preparing our country for its liberation."

Trade Announcement

THE headquarters of Mr. A. Healey, Dunlop director of production, have been transferred from Fort Dunlop to St. James's House, St. James's Street, London, S.W.1.

Recce Wing

Bringing in the "Gen": Moonlight Reconnaissance and Night Photography: Unarmed Operation

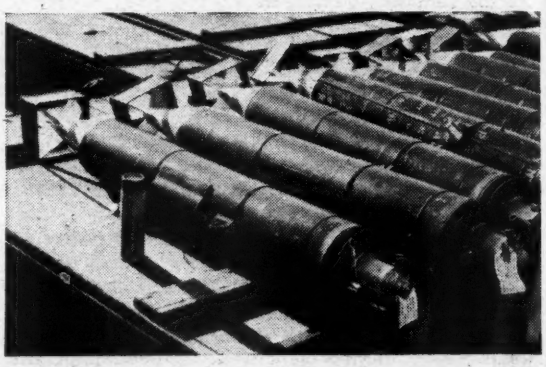
By JOHN YOXALL

IT has been said, very truthfully, that if a commander has only a little air support to use he would do well to concentrate on reconnaissance even if it means doing without other offensive and defensive operations. The R.A.F. have always laid emphasis on the need for continuous and accurate reconnaissance work. In this third article of the series dealing with the part air power has played in the drama now being enacted in Germany, our war correspondent describes some of the activities of a reconnaissance wing stationed on the Continent.

SO soon as I arrived at 2nd T.A.F. headquarters a cryptic message came from a reconnaissance wing requesting my presence on the carpet. I gathered it was because I had once dared to suggest that some other people were able to take better aerial photographs at night than they could! Would I please make sure to come on a day when the group captain and his squadron commanders were there.

Sure enough they were there. As I was ushered into the presence I was encircled by the group captain and a covey of wing commanders and squadron leaders, and immediately challenged with, "You said the Americans are years ahead of everybody in aerial photography at night. We'll show you."

The foregoing will give some idea of the keenness of this wing. Unprecedented even in a Service so continuously on its toes as is the Royal Air Force. Actually, of course, the American photoflash bomb of



The "small" 1,000,000 candle-power flash cartridge compared with a row of 4.5in. 200,000,000 candle-power flash bombs.

700,000,000 candle-power, compared with our 200,000,000 candle-power bombs, does enable our Allies to operate from much greater heights, and it is fair to say that the photographs obtained are academically more perfect. Our people, however, do not let this handicap affect the finished result.

An exceptionally good night aerial photograph taken from a Mosquito by the aid of a 4.5in 200,000,000 candle-power flash bomb. Even the slightest activity on the roads would be apparent.

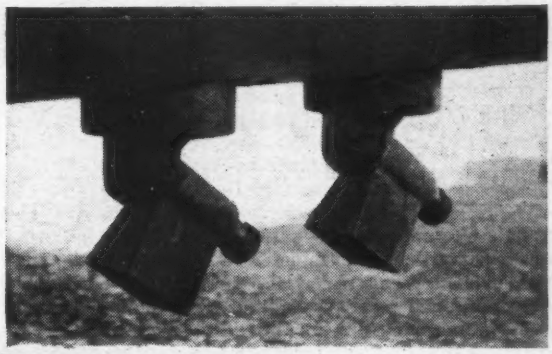
A line-up of typical aircraft used by the Reconnaissance Wing for day and night photography. The Wellington has a turretless nose, and both the Spitfire and Mosquito are unarmed.

They just work from much lower altitudes and, by very accurate navigation, get equally good results. The Mosquitoes operate at anything from 2,000ft. to 8,000ft., while our Allies—also using Mosquitoes—reckon to perform at any height from 12,000ft. upward.

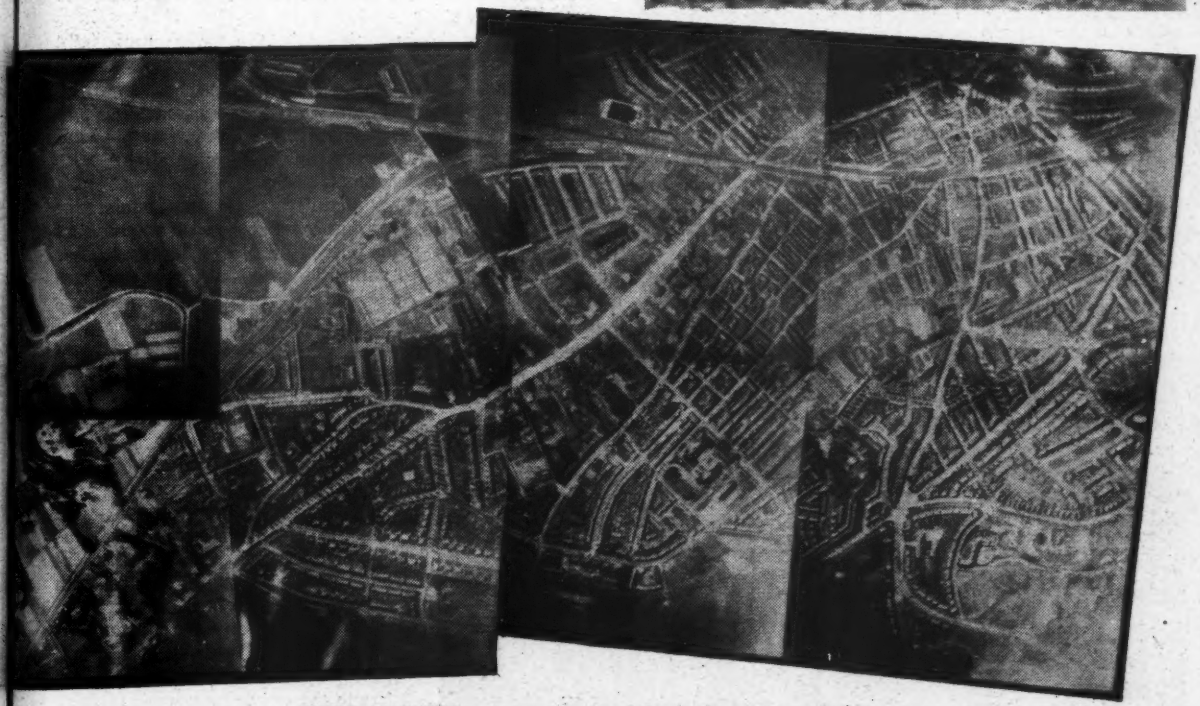
The Wellingtons of this wing, whose normal job is to do visual reconnaissance at night by the aid of moonlight, sometimes take photographs from as low as 800ft. They do this by the aid of small cartridge flares of only one million candle-power. For this purpose a special camera has been evolved with a continuously moving film. The rate of film movement can be adjusted in relation to the ground speed of the Wellington.

Although Bomber Command occasionally do a tactical job, it is safe to say that the recce wing is the only unit to combine strategic and tactical work as a normal line of business. Day reconnaissance, mostly photographic and strategic in nature, is carried out by Spitfires which are completely unarmed, and which operate usually at great heights even 38,000ft. to 40,000ft. on occasion. These carry several cameras, and long-focus lenses are essential to their work unless large-area map-making is the object. Lenses of 20in. or even 36in. focus are usually employed, but for map-making 8in. lenses are fitted.

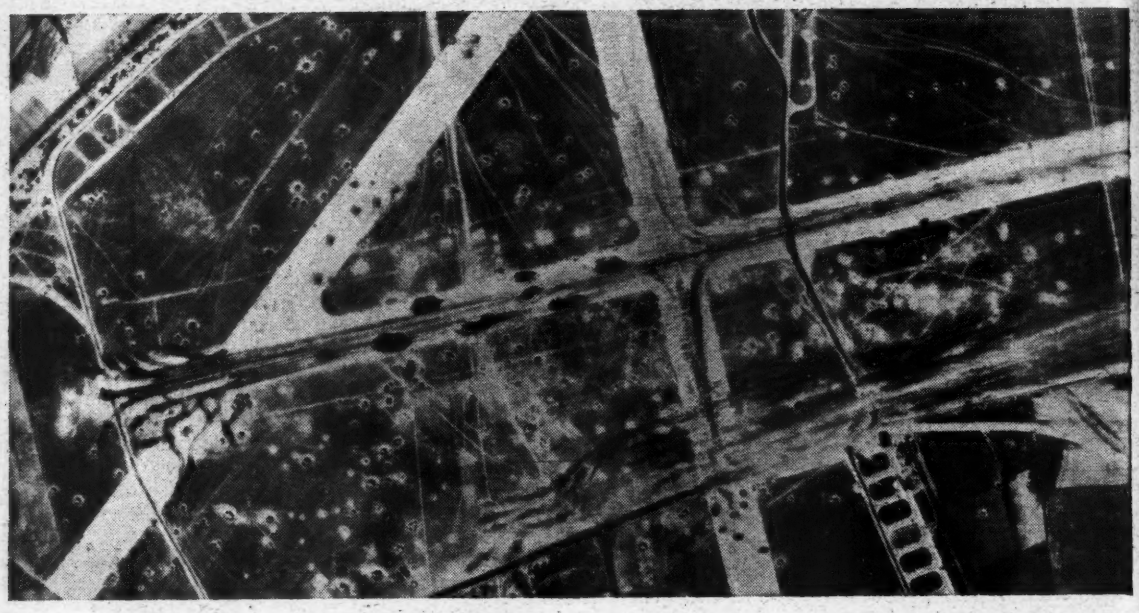
Despite the height at which these Spitfires fly, they are not always immune from attack,



The photo-electric cells which project beneath the fuselage of the Mosquito. These, through various relays, operate the camera shutter



NIGHT MAPPING: A mosaic map of the Arnhem area made from accurately taken flashlight air photographs joined together. The slight difference in tone at the joins is where the light falls off in coverage.



FROM VERY HIGH : A reconnaissance photograph of the Rheine airfields showing the defrosting marks made by German jet-propelled aircraft as they started up and took off. The airfield and runways appear to have been pretty soundly bombed by the U.S. 8th A.A.F.

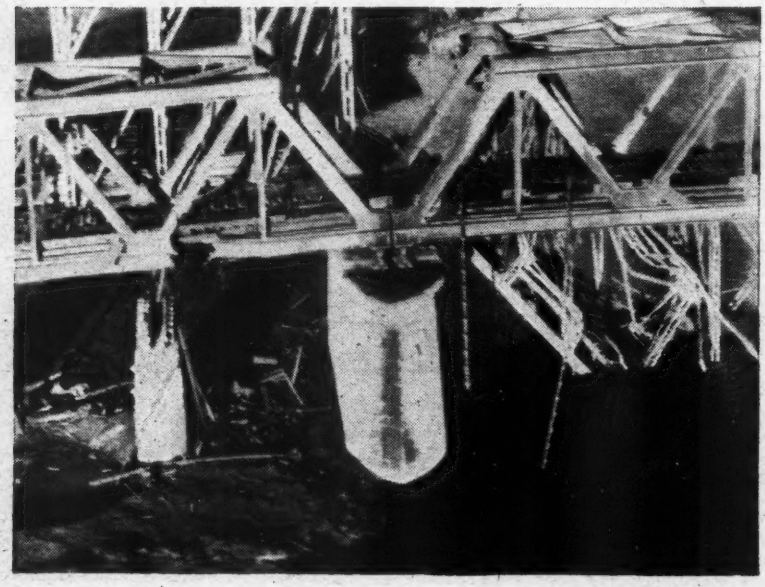
RECCE WING (CONTD.)

but, although unarmed, they have been known to win air battles. There was the case, for instance, when one Spitfire was attacked over North Germany by two rocket-propelled Messerschmitt 163 fighters. They made alternate attacks until the Spit. pilot decided to use his very high terminal velocity (0.82 of the speed of sound) to get away. He went down in a very steep dive at about 620 m.p.h. from 20,000ft. down to 3,000ft. On pulling out from the dive he blacked out and later found himself going vertically upward. One of the 163s which chased him down had over-dived and was a smoking ruin in a wood; the other one pushed off. The Mosquitoes do a tremendous job at night for the Army. They have to photograph roads, river crossings, railways, marshalling yards, detraining points, or, in other words, any movement whatsoever on road, rail or water. The Army frequently specify the exact targets required, and air liaison officers from the Army are on duty in the operations room. It is one of their jobs at the briefing to give aircrews an overall picture of the military situations and to show how the night's work will fit into the scheme of things.

Always, of course, there is the continuous fight between discretion and valour. "Intelligence" squeals for more and more detail. "Operations" says "Mind this balloon barrage here and the concentrated *flak* there." But the wing never lets the side down—what the Army wants is always obtained, even if the price is sometimes very high.

Sometimes the reconnaissance Mosquitoes work in with the bomber Mosquitoes of No. 2 Group. The organisation is so silky that they can take full advantage of each other's work. It has been known for recce photographs to be taken at midnight and for No. 2 Group Mosquitoes to be attacking special targets shown on those photographs within three hours. That means only about 90 minutes elapsing between the actual exposures and the passing-on of vital targets by intelligence to operations.

In the reconnaissance operations room the maps are rather different from the usual situation maps with their yellow bomb line. Apart from urgent day-to-day requirements

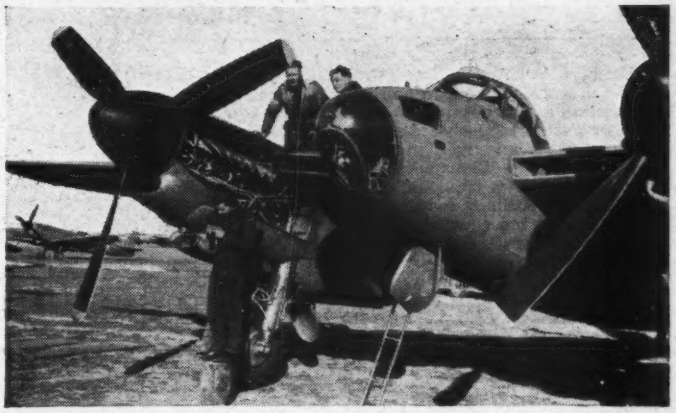


FROM VERY LOW : Complementary to the picture at the top of the page this photograph of Venlo bridge represents the other end of the scale.

RECCE WING

there is always a number of checking and map-making jobs on hand. These are indicated on a wall map, and their order of priority shown by the use of various coloured push-pins. On a second wall map are pinned the claims for the day, and, when the claim is allowed, the coloured pin is removed from the original map. There is also a third map on which patches of yellow dye show work already done.

Because of its effect on photography, the meteorological information given at briefings is very detailed. Even the slightest haze will reflect the light from a photo-flash back into the camera in such a way as to obscure the actual target, but it certainly appeared to be ultra-pernickety when the briefing met. officer warned crews that smoke drift from London would go over Northern Holland.



For the work the reconnaissance Mosquitoes have to do, a very high standard of maintenance is necessary.

The night work is terribly exacting for the pilots and navigators, but because experience is essential to the satisfactory execution of the work, long tours of operations are the fashion. Sixty trips constitute a tour for the night-flying photographic Mosquitoes, and forty operational flights for the visual reconnaissance Wellingtons.

CIVIL AVIATION NEWS

CANADIAN EFFORT

AIRCRAFT of Trans-Canada airlines now fly three round trips weekly between Montreal and Britain, and a further schedule development is being planned.

Mr. H. J. Symington, President of the Board of Directors, stated that "plans for international flights other than the present transatlantic service are still tentative, but the West Indies, South America and Pacific areas are of admitted interest to the company."

MADRID VISIT

A LARGE commission of U.S. civil aviation experts arrived recently in two Douglas aircraft in Madrid.

They were met at the Barajas Airport by Colonel Bono, Director-General of Spanish Civil Aviation, and later flew to inspect the new airport being built at Torrejon, near Madrid, in connection with the agreement concluded between the U.S. and Spanish Governments some months ago for the establishment of an air service between the two countries.

U.S. PREPARES

FOLLOWING a four-day meeting with representatives of the Civil Aeronautics Administration, spokesmen for private fliers throughout the U.S. appeared before the Civil Aeronautics Board to ask for a relaxation of the medical requirements for private fliers. At the same time Jesse Lankford, director of the C.A.B. safety programme, said that a revised version of civil air regulations was being considered to stimulate private flying.

A recent C.A.A. report estimated that within ten years after the war more than 200,000 private aircraft would be in operation, or eight times as many as the 25,000 aircraft in use in 1941. The report cited the possible development of the helicopter and other new-type aircraft that could be manufactured in quantity and sold at low prices as factors that would undoubtedly stimulate private flying.

Declaring that the manufacture of private aircraft would compromise the major portion of the post-war aviation industry, the C.A.A. report pointed out that the 300,000 pilots in the U.S. Air Forces and the 2,500,000 men and women now working in the aviation industry would form a core of flying interest after the war.

A National Airport Bill sponsored by the C.A.A. is now before Congress for doubling the 3,000 airports now in use throughout the U.S., with 90 per cent. of the new fields devoted principally to private flyers.

With more than 2,000 airfields in post-war use in the U.S., the C.A.A. estimates that at least 63,000 operational jobs will be produced, principally for U.S. soldiers and sailors returning from overseas, while more than 125,000 other jobs will result from the operation of new airports. In addition to private and commercial flying, the C.A.A. foresees a wide use of aircraft for many other purposes, such as crop dusting.

LUFTHANSA STOPPED

THE action of the Spanish Government in prohibiting German aircraft from landing in Spanish territory will, in practice, bring to an end all Iberian operations of the Lufthansa.

With the liberation of France, Lyons dropped out of the time table, and the 1,200-mile hop from Germany to Lisbon is too long for normal purposes.

The Lufthansa aircraft expected at Lisbon on April 14th is still at Barcelona, where it is believed to have been interned.

In Lisbon the Lufthansa ground staff has been reduced to a skeleton organisation.

Special private flights are another matter and raise different diplomatic problems. None such has occurred since the landing of a Junkers on April 6th referred to elsewhere in this issue.

CANADA–U.S.

AS a result of recently held conferences (*Flight*, March 1st) Canada and the United States have agreed on a two to one ratio of airlines operating with traffic between the two countries. Trans-Canada Airlines will operate after the war seven routes into the United States and Alaska, and American airline operators will fly 14 routes into Canada. Currently the ratio is eight to one in favour of American airline operators. On a trans-oceanic basis Minister Howe reported a trans-Atlantic service, a trans-Pacific service and a West Indian and Latin-American route.

The Atlantic route will be operated on a daily basis each way via Newfoundland from Montreal to London. This route is now flown by TCA thrice weekly each way in converted Lancaster bombers. The trans-Pacific route will be weekly each way from Vancouver via Honolulu to Australia and New Zealand. It will parallel a joint service operated by Great Britain, Australia and New Zealand. The West Indian and Latin-American route from Montreal or Toronto will be several times weekly to Bermuda, and via Miami to the British West Indies and Central America, with terminus at Trinidad. All these routes will be operated by the government-owned TCA or its subsidiary companies.

Traffic between Canada and the United States is now using one route, Toronto to New York, three times daily each way. Minister Howe outlined six additional routes to be operated by TCA, from Halifax to Boston; Toronto to Cleveland; Toronto to Chicago, with no stop at any Canadian point within 40 miles

CIVIL AVIATION NEWS

of Detroit; Port Arthur, Ont., to Duluth; Victoria to Seattle; and Whitehorse, Yukon, to Fairbanks, Alaska.

American airline operators will operate new routes from New York or Boston to Quebec; New York to Ottawa; Washington to Montreal; Washington to Ottawa; Seattle to Whitehorse; and Fairbanks to Whitehorse. Operating now by American lines are Boston to Moncton, N.B., and Boston to Montreal, by Northeast Airlines twice daily each way; New York to Montreal, five times daily each way by Colonial Airlines; Buffalo to Toronto, daily each way by American Airlines; Fargo to Winnipeg, daily by Northwest Airlines; Great Falls to Lethbridge, Alta, daily by Western Airlines; Seattle to Vancouver, twice daily by United Airlines. Under the agreement a second operator will be able to operate from Buffalo to Toronto.

BESPOKE REHABILITATION

THE tailors' share in planning a better post-war world is assured. The blessings of Savile Row are to be bestowed upon the world when high-speed aircraft will enable Savile Row craftsmen to accept, fit and deliver their masterpieces to anyone anywhere on the globe.

Making this prediction at a recent luncheon in London, Lord Brabazon is reported to have said that "it will immensely benefit the appearance of future citizens of the world."

New sartorial opportunities are thus opening to males from Kamtchatka to Fiji.

PLANNING

THE Portuguese Director of Civil Aviation has approved plans for the construction of a large international airport at Faro, on the south coast of Portugal.

EIRE APPROVES

THE Convention on International Civil Aviation signed in Chicago last December, and an interim agreement signed at same time, were unanimously now approved by the Dail.

Mr. Lemass, Minister for Industry and Commerce, said the Eire Government was willing to enter into bilateral agreements with all countries so that they would derive full benefit from their position on the main Atlantic route. U.S. airlines were granted full commercial rights of operation at the Shannon airport.

Regarding probable future development of air transport by Irish companies, in the present circumstances participation in connecting services to and from the Shannon airport was the most likely development.

Mr. Lemass said that on the basis of certain calculations made in the U.S. it was expected that 80 per cent. of traffic between the U.S. and Europe would travel via Eire.

REGIONAL PLANNING

EVIDENCE of keen interest in post-war civil air transport comes from local councils and regional bodies in all parts of the country.

An ambitious programme of services on internal, European and trans-Atlantic routes which they desire to operate has been prepared by Scottish Aviation. Salient features of the Scottish plan are to operate without subsidy and at passenger rates based on third-class surface fares.

The issue of Prestwick is in the focus of Scottish interest, ably championed by Group Captain D. F. MacIntyre. Scotsmen feel that the Government has given them only frustration and discouragement and claim for Prestwick possibilities of development as a landplane and flying-boat base which Heath Row could not fulfil.

In a recent address before the Glasgow Rotary Club, Capt. MacIntyre complained that, even in a very minor case, despite many requests to tie the trans-Atlantic airport to Prestwick with a Scottish Airlines service to London, and despite clear proof that the Prestwick organisation is more than capable of running this efficiently, the route has now been given to a railway combine.

In Wales a committee representing the Carmarthenshire, Glamorgan, Monmouthshire and Pembrokeshire County Councils, and the county boroughs of Cardiff, Merthyr Tydfil, Newport and Swansea, have drawn up a plan for an international airport. The proposed site is in the vale of Glamorgan, 14 miles west of Cardiff and about one mile inland from the Bristol Channel at Llantwit Major. With an expenditure of £10,588,000 the scheme is to be executed in three stages providing for gradual extensions. Three runways—5,000, 4,000 and 3,850 yards long—are to be provided.

FROM PERU

THE Peruvian Company Lines Aerea Nacional (LAN) has established a new air service between Puerto Maldonado, a trading port in South-eastern Peru, and Quincemil, a gold industry centre.

The new service covers a route of 90 miles.

INTERNAL AIRLINES

SINCE Group Captain Macintyre's spech at Glasgow, advocates of Scotsmen's share in civil flying must derive at least some satisfaction from an official statement announcing that a daily service between Croydon and Prestwick will be operated jointly by Railway Air Services and Scottish Airways.

This is the first civil air service linking London with Scotland since the outbreak of the war, and is intended primarily for transatlantic passengers arriving at or leaving Prestwick.

PROTEST

SHIPPING AIRLINES, LTD., have issued through their chairman, Mr. R. D. Ropner, the following statement: "The board of Shipping Airlines, Ltd., which represents 37 shipping companies, including short-sea liners, deep-sea tramps and coasters, have considered the Government White Paper on civil aviation, and notice with regret the Government's decision to exclude them, and consequently a large number of shipowners, from the European corporation.

"They wish to make it clear that they are in no way connected with that group of shipowners who have been included through their connection with the railway companies. Shipping Airlines, Ltd., consider the form of the European corporation as suggested in the White Paper unsatisfactory."

THE HAVANA MEETING

THE first International Air Transport Operators' conference which opened at Havana brought together delegates from sixteen countries representing thirty-seven airlines, including seventeen from the United States.

The conference resolved that active membership should be open to operating companies who applied for membership before the conference as well as to those who are operating but have not applied or could not attend the meeting. This leaves the door open for a number of established airlines not represented at Havana, as, for instance, the Soviet air transport system. Forty-one companies from twenty-seven countries have been approved as active members and fourteen companies in eleven countries as associate members.

The former is applicable to companies operating scheduled international air services while the latter is open to any other air transport enterprise.

At a meeting on Wednesday, April 18th, when the discussion on the articles of association was continued, a membership clause was adopted ruling out "tramp" airlines.

One of the issues debated was the position of minor operators within the future framework of the association and in this respect they felt disappointed with the new executive on which they are not represented. This executive consists of three British representatives, two U.S., one French, one Dutch, one Swedish and Brazilian member. Four places were left open for later election, thus providing for the representation of operators absent at present. Mr. Symington, of Trans-Canada, was elected chairman of the association for 1945-46.

It should be noted that the meeting avoided the election to the executive of any representatives of Central European operators, thus eliminating controversial issues arising from the political situation in these countries.

British, American, Scandinavian and French representatives seem to be satisfied with the executive, and Col. Liu, of China Airways, whose election was expected in view of China's importance in Far Eastern air transport, was pleased with the nomination of Mr. Cambridge, of Indian Airways, for the executive.

Incidentally, the Dutch member of the executive, Mr. Plesman, of the K.L.M., was absent from the meeting as he was only liberated from the Germans a few days ago.

A Swedish proposal for uniform rates was rejected for the immediate future owing to the great difference in operating costs.

Representatives of companies not operating due to war contingencies were not impressed by their own possibilities for future development, although the conference provided special resolutions covering their re-entry into operations and classification of active membership.

Montreal, already the seat of the inter-state interim Council of Civil Aeronautics, has been selected as the domicile for the Association headquarters.

OUR FUTURE IN THE AIR

Widening the Public Interest in the New Era of Commercial Aviation : Exhibitions and Films Desirable

By G. GEOFFREY SMITH, M.B.E.

IN connection with the International Airport scheme being sponsored for the West of England by the Bristol Chamber of Commerce, one of the aims is to rouse the public to a sense of the importance of air transport to the future of this country.

Last week, at the Grand Hotel, Bristol, a small party, presided over by Col. Mark Whitwill, C.B.E., F.I.C.S., Chairman of the Bristol Chamber of Commerce, was addressed by our managing editor, of whose remarks the following is an extract.

I RETURNED from the United States immensely impressed by the extent of air travel and the variety of efforts being made to educate American public opinion to the imminence and importance of the age of air travel straining to stretch its wings, so to speak, as soon as the "Cease fire" sounds. The conviction grew upon me that there must sound somewhere in Britain a slogan that will echo with equal force in these Islands, calling the Government and the nation to swift action if we are to assume leadership with our Allies on the air routes of the world. Public exhibitions by Training Command in America of actual aircraft, engines and superchargers, navigational aids, instruments and operation of the controls by the ordinary man or woman in the street, and particularly by youth, with working models of units like gun turrets, landing gear and v.p. airscrews, are a feature. If not aircraft, plastics and other exhibitions are held, and aircraft fittings form an important section of the displays. Reading matter and advertisements exhibit a predominant airmindedness that is lacking in this country, and we must make up this leeway without delay.

Bristol Fashion

A slogan must sound strongly and with no uncertain voice calling to action and, rising to the skies, proclaim that Britain's future, too, is in the air. That slogan must sound at once, but it is like preaching to the converted to address a Bristol audience and exhort them to become airminded. When in the R.F.C. I recall a visit to Bristol in the last war to inspect engines by Brazil Straker and the Cosmos Engineering Co., which indicates the ready enterprise of the West Country in those far-off times. Since then, the name of Bristol has been echoed throughout the world by reason of the magnificent aircraft, engines, airscrews and components which have been and are being produced in this locality. But the country as a whole is not typical of progressive Bristol, where you have at this day in course of design and entering the stocks an eight-engined transport aircraft of 130 tons and a huge wing span, incomparably larger and bolder in conception than anything now flying anywhere in the world. The last large aircraft "mock-up" I examined was the successor to the Martin Mars, a remarkable 82-ton flying boat —a three decker incidentally—now in course of development at Baltimore. So let me wish good luck to the enterprising Bristol Aeroplane Company with the new Brabazon I long-distance air liner—a veritable "Queen Mary of the Air." And talking of Queen Marys, only those who have lived in America know the immense propaganda value to this country of the *Queen Mary* or *Queen Elizabeth* liners regularly arriving with great majesty at New York dead on schedule.

Let us not forget that the Imperial Airways Transatlantic Service was in operation in 1939 before Hitler forced Britain into its initial lonely crusade against aggression by a totalitarian State. Much progress must be made before we can again behold on a map of the world's air routes, the promising dominant red lines indicating our Empire air lines and intercontinental services. It will not be easy, and it would be a bold man who attempted to dogmatise upon the future of the British aircraft industry after the war, when the demand for new aircraft for passenger and freight transport will undoubtedly be conditioned by the sort of world in which the nations find themselves.

The transition of our now immensely expanded aircraft industry, with its 2,000,000 personnel, from a wartime to a reduced peacetime basis will be a vitally important period in its history—vital indeed to our future national prosperity. Peace may come suddenly this month or next month, and British industry must be ready for it with carefully planned ideas of procedure. The haphazard improvisation of 1919 onwards will not do again this time. The lapsing of a big aircraft industry built up after many years of toil and sweat and blood, is repugnant to all, and particularly to the mind of the engineer.

Whether nations in an entirely changed world will again resort to fierce competition or work in a collaborative spirit for the good of mankind cannot be foretold, but indisputably commerce will remain the lifeblood of civilisation. And "Civilisation is Transportation," as Kipling aptly reminded us in one of his stories. Into this post-war arena a new international air transport system of immense importance to the future well-being of the world at large is being moulded, and the British share in its development and government must be commensurate with the size and importance of our Commonwealth, and with our responsibility for the future of the millions of the ordinary men and women who go to make it what it is.

So our populace must become more and more airminded and air-conscious, and very serious consideration devoted to the potentialities of the most striking revolution in the method of propulsion the world has yet seen and the drastic changes it will effect in aircraft design. I refer to the new motive power of aircraft which has broken upon an astonished world in the last two years of the war. A new prime mover comes to us but once in a lifetime. The turbine jet engine—a purely British development by an Englishman, Air Commodore Frank Whittle—which is akin in its epoch-making nature to the steam turbine for which another great Englishman, the late Sir Charles Parsons, was responsible, will revolutionise all forms of aircraft in the not distant future, whether they are jet-propelled or have turbines driving airscrews. Such are the lightness, smoothness, compactness, and the power of the turbine that aircraft will need to be remodelled, tailor-made indeed to accommodate them. Tremendous advantages will be gained in speed and efficiency in this way. By reason of greatly increased speed possibilities it will be imperative to embody aerodynamic qualities hitherto lacking in aircraft structures. There is urgent work for our scientists to cope with aircraft structural design for velocities approaching the speed of sound.

Horse Before the Cart

Actually to-day the position of aircraft and engines is rather reversed in the matter of progress. At one time airframe constructors waited upon engine manufacturers. For some years power units have been ahead of aircraft structures in modernity and high-speed capabilities, and herein lies the greatest opportunity for advancement. What this means is that drastic changes in the propulsion method, in design generally and means of control will occur within two

OUR FUTURE IN THE AIR

or three years. Modern types of aircraft which today we regard with such admiration may be rendered obsolete. Progress will be quickened. This fact is appreciated in the U.S.A., where it has been proposed to scrap or sell excess or obsolete aircraft so that they do not hang as a dead weight over the Air Force or retard development in view of their success with the simple gas turbine power unit developed from Whittle's basic design.

The difference between this country and America in the matter of turbine development is that the recognised aircraft engine manufacturers here have turned their attention to turbines, whereas in the States famous turbine manufacturers have up to the present taken a hand in producing smaller turbines for aircraft. In the near future the gas turbine will far exceed the power of any "up-and-down" type of aircraft engine in existence. 5,000, and anon 10,000, h.p. units are within the range of possibility, and the great attraction is that they can be designed and manufactured in a quarter the time needed to produce a new type of piston engine—twelve months instead of four years.

We need large power units for the ambitious new airliners now being produced. Thus active research and development must go on. The Government has accepted the idea of a National College of Aeronautics, but the fruits of its labours will take time. The Royal Aircraft Establishment at Farnborough has proved an enormous help to industry. It is important that private enterprise be free to progress, and one may be sure that the Government will remove hampering wartime controls as quickly as practicable. Firms should be given every encouragement and all Governmental assistance possible in their development work. With wise leadership this country can, and will, take a leading place in civil aviation as in shipping, but war has for some years diverted our attention from civil types. At the moment Britain is not equipped to meet strenuous competition. On the other hand, the superiority of our combat types in the hands of brave pilots of the R.A.F. and Fleet Air Arm has demonstrated to the world Britain's engineering genius and creative ability, whether we consider aircraft as a whole, their power units, their equipment, or methods of navigation by electronic devices.

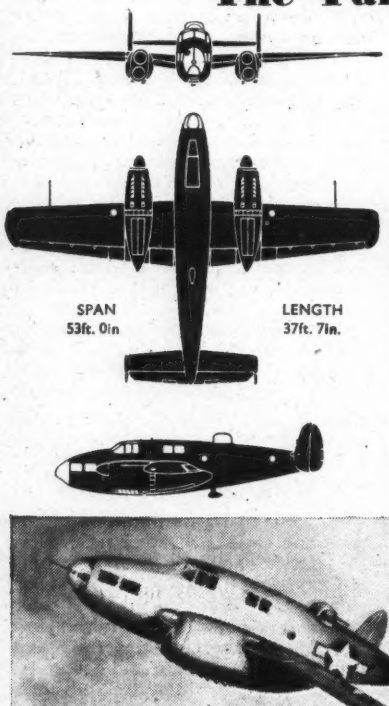
In grappling with the great problems associated with the change-over to peace, it is imperative that we maintain the finest research facilities and continue our advance design and development work.

I wonder how many realise to the full what air power really means? The prospect of pilotless and crewless aircraft, remotely controlled from the ground by electrical means, can in the future prove of value in commercial aviation or freight carrying, but, on the other hand, the idea possesses alarming possibilities if adapted for war use.

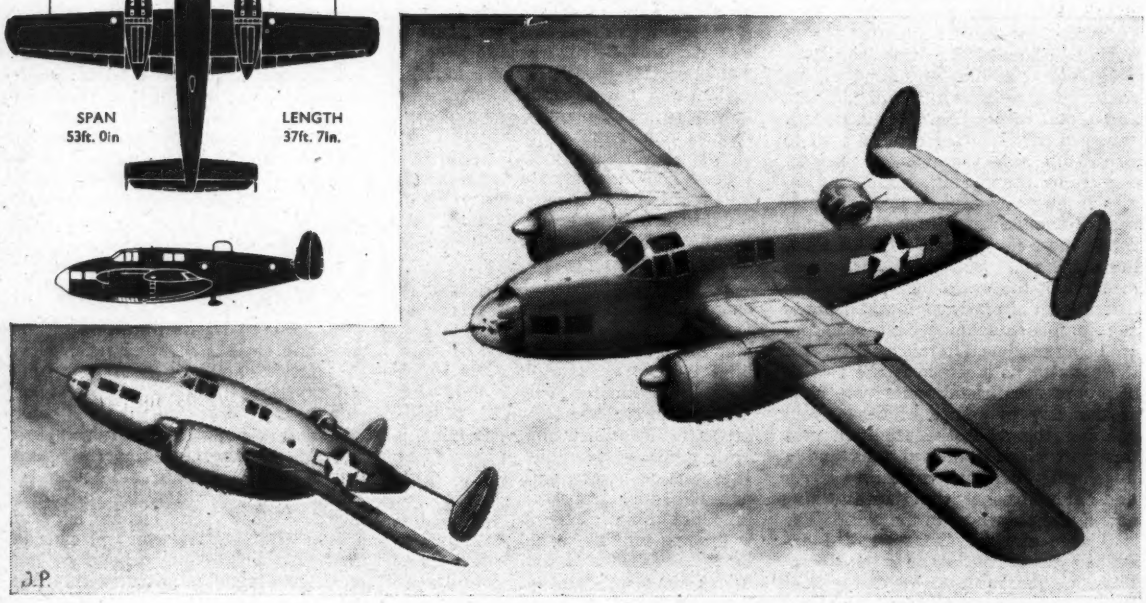
The Empire looks to this country for enterprising leadership. To encourage enterprising youth to become air-minded, first-class exhibitions are desirable. Technical training schemes at schools and colleges are also all-important, whilst educational films can help materially. In the directions indicated we shall be able to build up a strong air-minded Empire.

We must make use of every facility air transport can afford in establishing ourselves and our manufacturers in the markets of the world, so ushering in the age of peace and prosperity that will enable and establish the new way of life so many of us want to see, with secure employment for our people. For many years now we have heard the slogan "Export or Die," but a better one might now be "Fly or Die." A strong and virile aircraft industry is in itself the finest insurance of security and prosperity.

The Fairchild AT-21 "Gunner"



A development of the XAT-14 "Bombardier," the Fairchild AT-21 "Gunner," is a five-seater advanced gunnery crew trainer and is also built by the Bellanca and McDonnell concerns. It is powered by two 12-cyl. inverted V-type air-cooled engines of 450 h.p. each and has a top speed of 210 m.p.h. One 0.3in. machine gun in the Plexiglas nose and two more in the power-operated dorsal turret provide simultaneous practice for two of the three pupils carried besides pilot and instructor. The "Gunner" has a service ceiling of 20,000ft. and a normal range of 736 miles.



Dangers in Turning

High-speed Stalled Turns : Need for a Stall-warning Device : Gyroscopic Effect of Airscrews

By A. SIPOWICZ (Sqn. Ldr. Polish Air Force)

MANY young pilots trying to show their skill in steep turns at low altitude have met with accidents, some of them fatal. As a rule this does not frighten off the newcomers, and similar accidents still occur, though not so frequently as in the old days. Generally speaking, however, the decrease in the number of accidents is due not to the better knowledge on the part of the pilots, but to great improvements in the flying qualities of modern aircraft, and, to a lesser degree, to stricter flying discipline. But as yet I have not heard a full simple explanation of all the dangers facing a pilot during a turn, and the description below is my attempt to review these dangers as I know them from theory and practice.

All the accidents following badly performed turns are caused by an inadvertent stalling of the aircraft, with a subsequent spin, from which the pilot could not recover without sufficient altitude. The question arises, why does this often happen to an aircraft during a turn, while in straight flight an inadvertent stall hardly ever occurs? The answer is: the airspeed ceases to be a reliable indicator of the angle of incidence, and there is no instrument that warns the pilot of approaching stall.* The pilot has to rely exclusively upon his "feel," and that may be very deceptive, especially when a strong wind is blowing, as will be shown later.

Let us at first recall why an airspeed is a good indicator of the corresponding angle of incidence in straight flight. According to Newton's Laws of Motion, if a body does not change its speed or direction, all external forces acting on the body are in a perfect equilibrium. That means that the weight of the flying aircraft is perfectly balanced by the resultant of aerodynamical forces acting upon it. On the other hand, aerodynamical forces for a given aircraft and altitude are proportional to the square of airspeed—v^2, i.e., their resultant may be represented by a product av^2, where "a" is the coefficient of proportionality. It follows, then, that for any steady unaccelerated flight, whether climbing, level flight or descent, the weight "G" of the aircraft equals the product "av^2," i.e., $G = av^2$.

Indirect Connection

So long as the weight G and airspeed v remain unchanged, the equation shows that the coefficient "a" must also remain unchanged. On the other hand, experiments show that this coefficient for a given aircraft and at a given altitude depends only on the angle of incidence. In other words, for the same angle of incidence the coefficient "a" remains constant. This fact, together with the equation, show that for a given aircraft and a steady unaccelerated flight each airspeed corresponds to a certain value of the coefficient "a" and therefore to a certain angle of incidence.

Thus an airspeed in steady flight indicates the angle of incidence, though not in a direct way. The greater the angle of incidence the lower the airspeed, and a certain low-limit speed shows the stalling angle of incidence, thus giving the pilot the necessary warning.

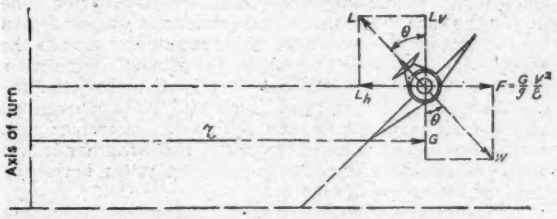


Fig. 1. Equilibrium of forces in a turn.

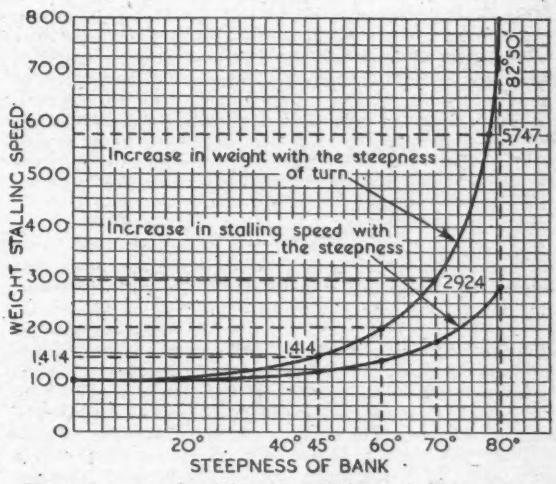


Fig. 2. Increase of weight and stalling speed, with angle o bank in correct level turn.

The reader must, however, remember that the interconnection between angle of incidence and airspeed remains valid only so long as the weight of the aircraft concerned remains constant. From the equation $G = av^2$ we see that if the weight G is changed without changing the angle of incidence (determined by the coefficient "a") the airspeed "v" must be correspondingly changed. If on one occasion the weight of an aircraft is G_1, and on another G_2, then for flying at the same angle of incidence the airspeed v_1 must be changed to the value v_2, which may be determined in the following way:—

$$G_1 = av_1^2 \text{ and } G_2 = av_2^2.$$

Dividing one by the other we find:—

$$\frac{v_1^2}{v_2^2} = \frac{G_1}{G_2} \text{ or } v_2 = v_1\sqrt{\frac{G_2}{G_1}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The weight of an aircraft is equal to the force of gravity only in steady, unaccelerated flight. In turns, all aircraft are subjected to the action of centrifugal force which, together with the force of gravity, may give a resultant greatly exceeding the latter.

A pilot turns the aircraft by banking it so that the horizontal component "L_h" of the lift "L" provides the necessary pulling force towards the centre of the turn. From Fig. 1 it is easily seen that for a level turn the vertical component of lift L_v must balance the force of gravity (G), i.e., $L_v = G$, and that the horizontal component (L_h) of the Lift must balance the centrifugal force (F). The resultant force (W) may be determined by the simple trigonometrical relation with the force of gravity, evident from Fig. 1. Denoting the angle of bank by "θ," we find:—

$$W = \frac{G}{\cos\theta} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

* Actually the American C.A.A. has sponsored a stall-warning device which will soon be on the market.—Ed.

DANGERS IN TURNING

Equation (2) determines the increase in weight of an aircraft while turning; equation (1) determines the necessary corresponding increase in airspeed. The most important airspeed to know for safety reasons is the stalling speed. The stalling speeds of all aircraft are given in their manufacturers' descriptions for steady flight. The increased stalling speeds in turns, calculated according to the equations (1) and (2), may be taken also from Fig. 2.

For this purpose the weight and the stalling speed in steady flight are denoted by number 100. The graph gives the increased weight and the increased stalling speed in connection with the angle of bank as the percentage of the weight and speed in steady flight. Thus we see from the graph that in a turn of 60 deg. bank the weight is 200 and the stalling speed 141 as compared with 100 in steady flight. At 83 deg. bank the load increases to nine times its normal value and the stalling speed to three times its value in straight flight.

Stalling on a Turn

The first danger in turning lies in an insufficient realisation of the changeability of stalling speed with the bank. This danger as a rule is not great enough to cause an accident. The so-called "feel" of the pilot usually saves the situation, warning him of the approach to stalling by the observed sharpness of the turn and the "sloppiness" of the stick, even if he does not look at the instruments. There are, however, circumstances, when this feel is very deceptive, advising the pilot to act contrary to the safety of himself and the aircraft. Such circumstances arise during steep turns at low altitude with a strong wind blowing, when the aircraft turns from windward to leeward.

In such a turn three different factors could increase the danger of stalling to a fatal limit, by giving the pilot a deceptive feel or by directly diminishing the lift.

The first factor affecting the feel of the pilot during a turn in a wind is the pilot's visual judgment of the sharpness of the turn. In still air a pilot can choose a point on the ground as the centre and make a perfect circular turn round it, seeing all the time the immovable centre of the turn at the same distance. In other words, the radius

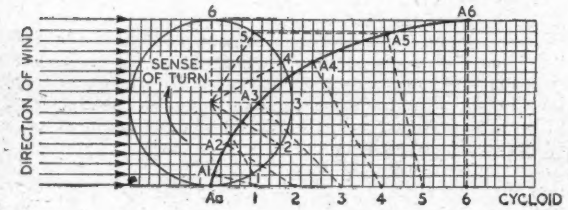


Fig 3. Track over ground of turning aircraft when the airspeed equals the strength of the wind.

of a correct turn in still air, as seen on the ground from the aircraft, remains constant. This is not the case during a turn with a strong wind blowing. The centre of a turn in wind, as seen on the ground from the aircraft, moves with the velocity of the wind, and, what is most important, the radius of the turn changes rapidly. The track on the earth of an aircraft making a perfect circular turn in the air is not a circle but a curve called a cycloid. A cycloid is produced on an immovable background by a point moving along a circle, the centre of which moves in a straight line. If the speed of the point on the circle is equal to the speed of the movement of the latter, the point traces an ordinary cycloid; if its speed is greater than the speed of the shift, the cycloid described is a shortened one. Usually the airspeed of an aircraft is greater than the strength of the wind encountered, and therefore as a rule, the trace on the ground of a turning aircraft is a shortened cycloid. The features of a cycloid that are of great concern to every pilot are easier to follow in the case of an ordinary cycloid, and therefore let us examine the latter as a supposed track of a turning aircraft.

We may represent an ordinary cycloid as the track of a point on the circumference of a circle which rolls without slipping along a straight line. This makes it easy to construct the cycloid as represented in Fig. 3.

For a pilot the most interesting feature of a cycloid is that its radii of curvature as represented by the lines 1-A_1, 2-A_2, 3-A_3, 4-A_4 are not constant but increase from zero to the double value of the turning radius after 180 deg. turn. This fact is seen by the pilot making a turn in the wind as an apparent increase of distance to the centre of the turn. Consequently the pilot imagines that he is involuntarily distending the turn. If such a pilot attempts to make a show turn he reacts to this by pulling the stick and trying thus to retighten the turn. Stalling of the aircraft is easily produced in this way, especially as another circumstance seems to corroborate the pilot's impression.

The wind is not the same in speed at all altitudes. The earth's surface hampers the flow of air by friction and causes the gradual slowing-down of the wind with the approach to it. In other words, consecutive layers of air move with increasing speed with increasing altitude. This increase or gradient of the wind is especially noticeable at low altitudes.

A banked aircraft has its wings in different layers of air. The elevated wing is exposed to a faster airflow and the depressed wing to a slower one due to the gradient. In a turn from windward to leeward this difference causes an additional moment tending to overbank the aircraft. Thus a visual impression of an involuntary distention of the turn is accompanied by a behaviour of the aircraft occurring in still air only during underbanked turns. The natural reaction of the pilot is to pull the stick, causing thus an involuntary stall.

The Up-wind Turn

It may be of interest to notice that opposite turns (i.e., from leeward to windward) have the factors mentioned above acting in the opposite direction and producing the opposite effect. The centre of such a turn seems to approach and the aircraft has a tendency to flatten the bank. The pilot's feeling advises him to distend the turn and thus makes such a turn even safer than in still air. The author has observed and heard about several crashes following windward-leeward turns, but never heard about similar crashes from a leeward-windward turn.

A further danger in turning during wind arises if a turn is being made in a zone where a downward air current occurs. Some airfields are surrounded by hills or high buildings. In such cases on the leeward side of the hills downward air currents are present when wind is blowing. Pilots should avoid making turns over such a zone. The author has personally observed an accident from such an attempt. An overloaded transport plane took off from an airfield adjoining the city of Warsaw. The pilot was afraid to cross the city at a very low altitude being unable to climb faster on account of the overload. He tried to make a turn just before a belt of very high buildings. A comparatively flat turn, certainly not exceeding 45 deg. of bank, in the downward air current produced such a pressing down effect that the aircraft could not recover and crashed on the ground. Fortunately no one was killed, though one of the crew was seriously injured. The pilot declared that the aircraft was not stalled and preserved all the time a perfect manœuvrability with the exception that it could not be kept in level flight, being depressed downwards all the time during the turn. The truth of his statement was confirmed by the fact that the aircraft preserved during its fall the normal flying attitude and fell on the ground on the three points as if landing. The only explanation was that the overload before the take-off, increased by the overload arising from turning and by a downward air current gave such a downward momentum to the aircraft, that it was unable to recover while passing a relatively thin horizontal layer of air above the ground.

To complete the list of possible factors endangering a turn it may be mentioned the gyroscopic effect of the air-

DANGERS IN TURNING

screw. Many pilots do not understand that effect very clearly, and a simple explanation given below may be of use. A balanced rotating body tends to maintain its axis of rotation. If a force is applied tending to turn the axis in a certain plane, the axis does not follow the force applied but begins a new rotation at right angles to the plane of acting forces. This can be easily verified and demonstrated by a simple experiment. Take a bicycle with its axle suitably extended from one end. Put this end (A) of the axle on the top of a pillar support as shown in Fig. 4. If the wheel is stationary it is necessary to support the other end (B) of the axle, since otherwise the wheel will topple over, following the action of gravity. But spin the wheel rapidly in the position as shown in Fig. 4. On releasing the free end of the axle the wheel retains its vertical position so long as it continues to spin at high speed, but it acquires a new rotational motion round the vertical axis A-A. In other words, the axle A-B begins to rotate in a horizontal plane, perpendicular to the direction of acting gravity forces. This new motion of the wheel is called the "precession."

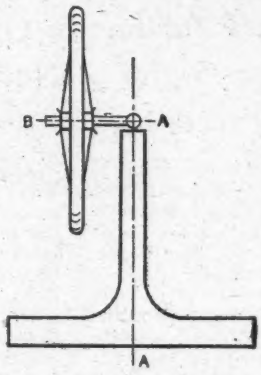


Fig. 4. Simple gyroscope represented by a spinning bicycle wheel.

Why it arises instead of the expected toppling over of the wheel may be simply explained by the device shown in Fig. 5. Two plates A and B forming two walls are fixed to a rotatable support C on the base D. Between the walls the ball E is circling, being attached to the spindle F by a thin elastic thread. Let us imagine now that the base is being banked as shown by the arrows. The ball E attached only loosely to the spindle will preserve its original motion —climbing upwards, as shown in Fig. 5. But in that motion it encounters now the banked wall B, pressing against it and causing thus the rotation of the support C around the vertical axis. The effect will be the same if the two walls are removed and instead of them the ball E is attached to the spindle by a firm non-elastic blade. In this way such a device clearly shows the effect which in a flying plane is produced by the airscrew during turns. The airscrew tends then to lift or to press down the nose of the aircraft thus increasing or diminishing the angle of incidence.

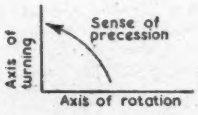


Fig. 6. The principle of precession.

This tendency is not the same for all aircraft, as it depends on relative senses of rotation of the airscrew (gyroscope) and of the turn. Fig. 5 shows clearly that if the ball E is flying upwards and the contraption is banked to the left, it will rotate anticlockwise looking from above. But if the ball flies downwards in the same conditions it will turn the contraption clockwise. A simple rule for the gyroscopic deviation may be deduced in the following way:—

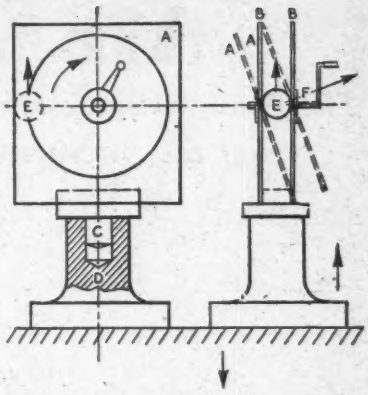


Fig. 5. Gyroscopic effect demonstrated by two plates on a rotatable support, a spindle and a ball attached to it by a thin thread.

Let us represent rotational motions or moments tending to produce them by lines with arrowheads pointing in the direction perpendicular to the plane of rotation. The arrowheads are located at the side looking from which the rotation appears to be clockwise. Then, as may be seen from Figs. 5 and 6, the precession has always the sense from the vector representing the rotation of the gyroscope itself to the vector representing the moment tending to turn the axis of the gyroscope.

Let us examine the case of an aircraft with the airscrew rotating clockwise as seen from the pilot's seat. Here the vector of the airscrew rotation points to the tail of the aircraft. In left turns the vector of the turning moment points downwards. The precession according to the rule of Fig. 6 is directed from the tail downwards, depressing the tail and rising the nose. In right turns such an aircraft has tendency to dip the nose. An aircraft with an anticlockwise airscrew is, of course, subjected to the opposite gyroscopic effects.

The gyroscopic effect adds to the difficulties of a turn by producing the necessity of different steering while turning in different senses and therefore may increase an error caused by other factors. Of course blind flying or flying following instrument indications avoids all above-mentioned deceptive impressions. It is advisable, in making turns, to rely more on instruments than on visual observation.

A.I.D DINES AND DANCES

BEFORE the war it was the custom for the Aeronautical Inspection to give an annual dinner to "contractors," in other words, to representatives of the aircraft industry. This pleasant custom has suffered some interruption during the war, but recently the Southern Area of the A.I.D. gave a dinner and dance at Southampton to representatives of firms in the area: Vickers-Armstrongs (Supermarine), Saunders-Roe, Folland Aircraft, Airspeed, A.S.T., Fairey Aviation, Cunliffe Owen, Jesseman Rubber Co., Wadham Bros., Autometal Craft, and Longfleet Motor and Engineering.

Mr. A. H. Mitchell, of the A.I.D., was in the chair, and proposed the toast of the guests. Capt. E. D. Clarke, M.C., responded. Commander James Bird (Vickers-Armstrong) proposed the toast of the A.I.D., the response to which was given by Mr. G. Manning, Director-General of the A.I.D. since the death of Col. Outram. Mr. R. G. Green (Principal Inspection Officer of the Southern Area) proposed the toast of the ladies, to which Mrs. Mitchell replied.

Commander James Bird paid tribute to the sound foundations laid by the late Col. Outram, and referred to the A.I.D. stamp as the hall mark of British aircraft. This, he felt, would be of the greatest possible value to future British civil aviation.

The good relations between the A.I.D. and the industry were emphasised, and the menu card carried a very appropriate cartoon by Cumberworth, showing the lion taking coffee with the lambs. The wording was "It Really Happened." A most enjoyable evening. The A.I.D. has ever been a good host, and on this occasion it certainly lived up to its reputation.

THE INDUSTRY AND THE A.I.D.

AT a recent gathering of the A.I.D. Technical Staff Association in London Sir Stafford Cripps, in paying a tribute to the aircraft industry, stressed the importance of this country paying due attention to the power of being able to expand rapidly in case of need. The development of civil aviation was one way of ensuring this, and he expressed the hope that the A.I.D. would play their part in this field as well as in aircraft construction for the defence services.

Sir Wilfrid Freeman, unable to attend, sent a message to the A.I.D. Technical Staff Association, in which he thanked the A.I.D. "for the help and loyalty which they have given me as A.M.D.P. and Chief Executive. It would be difficult to exaggerate the debt which the aircraft industry and the country owe to inspection. You had it in your power to make or break the country's air programme. *You Made It!*"

Air Arm Paradox

The Bomb v. Battleship Controversy : Pendulum of Opinion : Vindication of the Aircraft Carrier : Rise in Status of Naval Air Arm

By B. J. HURREN

"IT doesn't add up right," complained the small girl about her arithmetic. Her sentiments may well apply to the extraordinary paradox which has arisen in naval air warfare.

It may be desirable first to recapitulate some of the events which led up to the present situation in the unending sea-air war. In brief, at the end of the 1914-18 war, the R.N.A.S. was in nowise the counterpart of the later-formed combined R.N. and R.A.F. Fleet Air Arm, which dates from 1923. It was something of a naval flying service, mainly operating with seaplanes, but entirely without the modern conception of landplanes operating from the decks of aircraft carriers. In fact, no aircraft carrier, as at present understood, saw action in the last war, though in 1917 on an improvised fore-deck to *Furious* the first land-on had been made by Squadron Commander Dunning.

In parallel with the first developments of the modern aircraft carrier, which led to the wholesale employment of landplanes for naval flying, the newly-formed R.A.F. (April 1st, 1918) had as the forerunner of the present Bomber Command a division under Lord Trenchard known as the Independent Air Force.

The I.A.F. was designed to operate in much the same way as the present Bomber Command. It had a preference for bombing Berlin, but in fact the war ended before the big Handley Page bombers could take off on that mission.

Controversy

We thus see the seeds of a controversy that was to part good friends and threaten amicable relations between the tradition-steeped Navy and the new-comer R.A.F. The former felt it had something extra special in its aircraft carriers, whilst the latter was equally sure it was no longer a stunt but a ferocious weapon in the hands of those who knew how to use Air Power.

Behind the scenes the controversy waxed hotter month by month; not the less because a large part of the Navy itself could not place faith in a naval air arm. The crux of the matter was the aircraft carrier. One school of thought said, broadly, that the carrier would never fulfil its mission since bombing would sink it or prevent it from operating aircraft. The other school asserted that the elements of surprise and long-range attacks without warning could be mounted by the aircraft carrier which—even with losses—would justify itself by its novel striking power.

The basic controversy was Battleship v. Bomber, with the rider of Bomb or Torpedo.

To settle the issue an important trial was staged in (I think) 1923, with the old warship *Agamemnon* as a radio-steered, crewless target at sea. Cohorts of interested observers watched this trial, which instead of dampening the fires of argument stoked them up.

The *Agamemnon* story, a secret at the time, has interesting points. Two aircraft were to make the attacks with practice bombs dropped from about 8,000 feet. One had to return to base shortly after take-off, thus conceding a 50 per cent. victory to the anti-bomber school.

Improvisation

The second made the programmed attacks. In the cockpit was a special signalling device for the bomb-aimer to direct the aircraft's pilot left and right on approach to the target. This device failed during flight, but in order not to disappoint the "customers" assembled for the trial, an astonishing improvisation was effected. A piece of string was attached to the pilot's ankles, and by this means the bomb-aimer literally jockeyed the aircraft into the winning position.

And what a position it was! Of eight bombs aimed at the moving target, two scored direct hits and the remainder fell as near-misses.

That was more than 20 years ago. The flaws in the trial and fallacies liable from its results are apparent. First the ship was undefended. Then the bomb run was uninterrupted. Then the technical hitches in the aircraft. Couple with these factors vague claims of new defence weapons and it is easy to see that neither school of thought, whether pro battleship or pro bomber, was satisfied.

So, divergent courses were followed. Under the blight of the Ramsay Macdonald disarmament era the Navy slowly went ahead with carrier construction, the *Courageous* and *Glorious* appearing before the end of the 'Twenties. In this time, bombers made no equal advance, and seemed to be hopelessly outclassed by the naval gunnery experts who—as is well known—take second place to none when arguing their own case.

There was, however, one significant fact. There was not at that date much to choose between the orthodox land-based R.A.F. aircraft and the sea-going land-undercarriage aircraft of the Fleet Air Arm borne in carriers. For example, the odds were not much between comparable fighters—the A.W. Siskin and the Fairey Flycatcher were not disparate in single-engine biplane fighter performance. But it was true the R.A.F. had big bombers, such as the Virginia and Hinaidi, which rumbled along at an air speed of 70 m.p.h.—even the L.N.E.R. could pass them if the wind was against them.

All this picture was scrapped when the first of the new monoplane fighters and bombers appeared. The Hurricane was in practice at least twice as fast as the best comparable naval fighter—say, the Nimrod—whilst the monoplane bombers, such as the Hampden, were far faster than the naval fighters.

The hopes of the bomber school thus soared, whilst correspondingly only the faith of the pioneer few of the Fleet Air Arm enabled the carriers to continue in being at all. For nobody in those days contemplated operating such fast-landing aircraft as a Hurricane on a carrier deck. (It must be remembered that at the time the Hurricane first appeared deck landings were made without the use of arrester wires.

Re-orientation

The arrester wire technique enabled a re-orientation of naval flying ideas. Nevertheless, in pre-war years, the idea of landing-on a Hurricane was horrific, although progress had been made to the stage where the Sea Gladiator (adaptation of the Gladiator) could be accepted for deck operation.

This slight advance in naval form was more than countered by the then secret development of the four-engined bombers (Stirling, Halifax, and later the Lancaster ex Manchester), which carried bomb loads so far undreamed of. Indeed, one of the reasons for Goering's frantic boast that the cities of Germany would never be bombed was the belief of the *Luftwaffe* staff that British industry simply could not build four-engined bombers in quantity and with sufficient defence to fight off fighters.

Thus, at the outbreak of war the Fleet Air Arm was equipped with fighters and bombers which were inferior in speed, in range and in bomb load (to say nothing of height and other aspects of flying) to the land-

AIR ARM PARADOX

based R.A.F. equipment. The Cinderella Service went into battle under the shadow of suspicion—doubt as to its useful value, in that German bombers would almost certainly sink the carriers, and misgivings to the effect that even if they were not sunk their aircraft would be massacred by land-based defence.

The doubters had a very good case. They went further and made a number of unsupported claims though they observed with bewilderment that the *Ark Royal* was not in fact sunk by bombs in spite of prolonged air attacks. Moreover, when things began to hot up in Norway, ships which were almost incessantly attacked by German bombers somehow lived to fight on, though some were sunk. *Courageous*, first aircraft carrier victim, was sunk not by bombs, but by the deadly torpedo from a submarine. *Glorious* vanished before naval guns, not before bombs.

In Narrow Seas

When Italy took up the sword, the bomber kings were sure the day of the battleship was ended. There were hundreds of competent Italian bombers available—but oddly enough not one of them sank a battleship in all the long years of opportunity in the Mediterranean. Nor was the bitter pill less palatable when British capital ships bombarded Genoa using "obsolete" biplanes of the Fleet Air Arm to spot the fall of shot. They flew at no more than 1,000 feet over the town and it might seem that here, if anywhere, the superior landplanes ashore should have gone into action.

Still doubt lingered over the issue. When Japan struck at Pearl Harbour and wrecked the fleet there, the bomber boys jubilantly—yet sympathetically for our Allies—said: We told you so. Three days later the British capital ships *Prince of Wales* and *Repulse* were sunk by torpedoes from Jap bombers, and again the cry went round that the day of the battleship was done. Air power alone had supplanted sea power in priority and was the clue to the future.

Then a remarkable thing occurred. Using aircraft-carrier aircraft, the U.S. Navy arrested the Jap path of aggression with a brilliant sea-air victory in the Coral Sea. The enemy invasion fleet was routed although it was *within easy range of the land-based aircraft defence range*, by the use of carrier-borne aircraft which had long been thought inferior.

Next, at Midway Island, the U.S. Navy, assisted in small part by long-range land-based Army Air Corps bombers, utterly defeated the most powerful invasion fleet the Japs had ever despatched. This was a contest of carrier aircraft *versus* carrier aircraft, and the losses in the air were hard on both sides. On the sea surface, however, the Japs suffered a defeat from which they never recovered.

As before, there were circumstances which could be argued in favour of both sides. But the Americans were convinced of the value of aircraft carriers, which they put into large-scale and rapid production. Their programme ranged from 45,000-ton super-carriers down to small "flat-top" escort carriers with the important *Essex* class in between.

Then came the first real test—at Leyte. The Japs had formidable sea forces, operating from a ring of islands on which were, or could be, based the best fighters and bombers. In theory, these land-based aircraft were far superior to the carrier-borne, and it was by carrier aircraft alone that the Americans could bring air power to the invasion of the Philippines.

The test was made, and the paradox was that the carrier aircraft won the victory in the air. Fierce battles were fought, but the answer was indisputable. Sea-going air power had proved itself under the sternest test of all—War.

To clinch the matter, action at Luzon and other Philippine islands left no doubt of the decisive result of the employment of carriers. But none of the official bulletins has made the point that only by the use of carriers could the necessary air umbrella be given the fleets at sea. The actions were fought hundreds of miles beyond the maximum range of friendly land-based fighter aircraft.

We now come to the most important test of all, though we cannot refrain from mentioning the series of attacks made by Barracudas, Avengers and Firefly fighters with full escort air cover by Hellcats, Seafires and Corsairs at widely separated points extending over thousands of miles of the Indian Ocean littoral, Dutch East Indies, Malaya and the nearer Far East. These attacks, all mounted by British carrier forces and carried on for more than a year, were against and in the teeth of land-based air opposition, with its acclaimed superiority over sea-borne aircraft.

Early in April this year, however, the issue was put to its biggest test of all. With great daring, the Japanese fleet was attacked in its home waters and within the protective range of the entire home-based Jap air forces. In spite of the protection accorded Jap warships in fierce air encounters between home-based fighters and Allied carrier-borne fighters, the American sea-going attack aircraft sank six of Japan's warships, including the mighty 45,000-ton *Yamato*.

Effective A.A. Fire—

Admiral Mitscher's report states that a large force of Jap aircraft was sent to defend the Jap fleet and attack the American sea forces. The result was that 116 Jap aircraft were destroyed, 55 by American fighter aircraft and the remainder by A.A. fire. Note that for the first time in any large-scale naval air engagement, the A.A. ship defences surpass the successes of the defending aircraft.

But note also the scale of the attack, for on the previous day the U.S. Navy had destroyed 245 Jap aircraft. This was done in the face of the best land-based air opposition.

A British carrier force was also in the engagements in this area. Before the main American action, British aircraft from carriers—and, of course, in the teeth of land-based air opposition—attacked airfields at Ishigai and Miyako (east of Formosa) and on the Ryukyu islands. In other words, the ring of air defence of the home-based Jap fleet was savaged by British aircraft - carrier fighters. In two days, it is reported, the Japanese lost 417 aircraft, mostly in the Okinawa area on the Friday and Saturday preceding the sinking of the *Yamato* on Sunday, April 8, 1945.

Several interesting points arise. The *Yamato*, Jap equivalent of the German *Tirpitz*, was sunk by at least eight torpedoes, eight rockets and machine-gun fire. The interpretation of this news is that it is not exclusively necessary to use the large armour-piercing bombs such as the 12,000 lb. jobs used against *Tirpitz* in the brilliant attack by R.A.F. Lancasters. On the contrary, a Swordfish can carry a torpedo and rockets. Once again the torpedo is shown to be by far the most dangerous of all present naval weapons.

But, by inference, if a single-engine aircraft can carry the means of destruction of a major modern capital ship, why worry about four-engined aircraft which, by their size, cannot be operated from aircraft-carrier decks? And if there is no patent need for the land-based heavy bombers in a sea action, clearly the case for the aircraft carrier gains the more by that.

—And Ineffective

The next thing to be seen in the official reports is that the Jap fleet did not rely on its own carrier air forces but on the land-based aircraft. In some astonishing way, despite the repeated lesson of the need of air cover in war at sea, the Jap fleet was unprotected by aircraft (most of them being shot down on the previous days) but relied exclusively on A.A. protection. Heavy though this was, only seven American aircraft were lost, against the sinking of the *Yamato*, a light cruiser, a heavy destroyer and three medium destroyers.

And so, twenty years and more after the furious controversies of the 'Twenties, vindication of the aircraft carrier has come. It is idle to write down the opposition of the Japanese air force, nor will any sane person assert that the best German and Italian attack aircraft are inferior aircraft. The fact of war is that the myth of land-based superiority has been exploded in every sea action where it has been put to the test, with the solitary exception of the slaughter of a flock of Swordfish in North Russia.

However, coupled with this a great change of heart in the Navy is apparent. The new breed of sailors remain faithful to the irrefutable principles of Lord Nelson, but the method of applying those principles now takes in the air arm as a first consideration. Great British Admirals like Vian, Rawlings, and the C.-in-C., Sir Bruce Fraser, seem to revel in their employment of naval air power. Their interest has been aroused to a pitch of enthusiasm, and it is infectious, spreading throughout every branch of the Senior Service.

We can expect important repercussions from this change in outlook. We can look forward to changes in the Admiralty, to junior officers being required to do gliding courses as they now do boat courses. We can expect a rise in the status of the Navy's air arm, and a good riddance to the airman's view of the salt horse as a pompous prig, and the sailor's view of the bird man as a pushing parvenu. We can expect an influx of new aircraft that will make the biplanes of yesterday seem like some strange nightmare. And, in line with this, a new type of carrier with entirely new devices for aircraft operation.

For Naval air power is in the ascendant. One of the subjects that will assuredly be discussed behind locked doors at San Francisco will be the future of Anglo-American sea-air power which to-day is of the maximum strategic consequence.

Private Flying

Announcement of Government Policy Wanted : Royal Aero Club's Good Work Behind the Scenes

AT the annual general meeting of the Royal Aero Club Lord Gorell, as chairman, had some interesting things to say on present and post-war private flying. From his speech we quote that part which dealt with the activities of the R.Ae.C. in connection with private flying, the insurance of private owners, and the question of certificates of airworthiness. On these subjects Lord Gorell said:—

"There have been no major developments to record, but considerable preparatory work has been carried out in readiness for post-war activities, and the Private Flying Committee has been giving special attention to these problems during the past year.

"Changes in the control of Civil Aviation have delayed our efforts to get a definite statement of policy out of His Majesty's Government as to its post-war intentions in connection with private flying, light aeroplane clubs, gliding clubs and similar activities which fall within the province of the Royal Aero Club. We have continued to press for a definite decision on these matters, including the disposal of surplus light aircraft on the cessation of hostilities, and on this latter question there have been joint discussions between the Private Flying Committee, the General Council of Associated Light Aeroplane Clubs, and the Society of British Aircraft Constructors, and their recommendations have been sent to the Minister of Aircraft Production. We have asked that preferential treatment should be given to the private owners and light aeroplane clubs, and particularly to those whose aircraft were taken over by the R.A.F. on the outbreak of war; and I might add that the new Minister for Civil Aviation, Lord Swinton, has said that he will be willing to receive a deputation on these subjects on his return from South Africa. In passing, may I say how glad we are to see the further appointment of Flt. Lt. W. R. D. Perkins as Parliamentary Secretary to the new Ministry. Flt. Lt. Perkins has served as a member of your Committee here, and so should be fairly familiar with our points of view.

Insurance

"Perhaps the Club's most notable achievement, for which a large share of the credit must be given to the Private Flying Committee, has been the production of the Royal Aero Club Aviation Insurance Policy for Private Owners. This policy form, which represents a great advance, both in simplicity and in the extent of cover given, over any form available before the war, had been accepted by aviation insurance brokers and underwriters and should prove of great advantage to private owners after the war. Exclusions and restrictions have been cut down to a minimum and the policy contains a condition that any dispute between the insured and the underwriters shall be referred to an arbitrator to be appointed by the Royal Aero Club, whose decision shall be final and binding on all parties. Following on this policy will come the appointment by the Royal Aero Club of official repairers throughout the country, and this is a matter which will be tackled by the Private Flying Committee in the near future. It is hoped also to produce appropriate policy forms on similar advantageous lines in due course for other aircraft users associated with the Club, such as the light aeroplane clubs and the gliding clubs.

"There are one or two other matters on which I should like to touch briefly in connection with the aviation side of our activities. First, as regards certificates of airworthiness for privately owned aircraft; it will be recalled that in 1934 a departmental committee of which I was Chairman, leading it to be called in air circles the "Gorell Committee," recommended that certificates of airworthiness for privately owned aircraft should be optional subject to the condition that a third party insurance policy must be effected and maintained in force.

"Following discussions between the Private Flying Committee, the Society of British Aircraft Constructors and the Air Registration Board, the Club has now recommended that in view of immediate post-war difficulties a compulsory certificate of airworthiness should be retained for a period of not more than two years after the lifting of the ban on private flying, the position to be reviewed on or before the end of that period. I do not propose at the moment to enter into details about the reasons for this recommendation, though I shall be glad to answer any questions on the subject at the end of these remarks. I am naturally a little sorry for the reversal of the 1934 Committee's recommendation, but there were strong arguments in its favour, and the decision was made easier by the very helpful attitude of the representatives of the Air Registration Board, who gave assurances which should considerably reduce both the time and cost previously involved in connection with renewals of certificates of airworthiness.

F.A.I. Records

"Secondly, as regards the F.A.I. (International Air Federation). When we last met, the headquarters of the Federation were in German hands, and you will remember that this Club took the lead in setting up a temporary committee to undertake the work of the Federation for such period as might be necessary. Since then France has been liberated and we are happy to find that all the records and archives of the Federation are intact.

"Our secretary, Mr. Perrin, has recently paid a visit to Paris, and met the Bureau of the F.A.I., and discussed details for the resumption of the activities of the Federation as soon as is practicable. Unfortunately, immediately on his arrival there he was met with the sad news that M. Paul Tissandier, the General Secretary, had passed away the day before. M. Tissandier had been associated with the Federation since its inception in 1905, and had rendered a great service to international aviation. He was mainly responsible for the introduction of the Customs Carnet for international travel by private aircraft, which was a great boon to our air tourists.

"We hope that as soon as practicable a meeting of the F.A.I. will be held in London, to which all available members of the Executive Committee will be invited, and at which a new Executive Committee will be appointed, so that the Federation may be in a position to resume its duties at the earliest possible moment.

"Various other matters have been dealt with in close co-operation with other bodies interested, such as the General Council of Associated Light Aeroplane Clubs, the British Gliding Association, the Society of British Aircraft Constructors and the Automobile Association. Amongst these has been the question of the tests for a helicopter pilot's certificate. These have been settled in consultation with experts, and will be submitted in due course to the F.A.I. for approval on an international basis."

"JANITROL" HEATERS

THE aircraft heaters ("Janitrol") described in our issue of September 21st, 1944, are now handled in this country by D. A. Daniel and Co., of 31-33, Bishopsgate, London, E.C.3, to whom should be addressed requests for further information about this interesting heating system.

SIR STAFFORD AND C.A.V.

DURING a recent visit to the factory of Vandervell Products, Ltd., Sir Stafford Cripps, in thanking the workers for their outstanding contribution to Britain's war effort, disclosed that the firm's output during the war years amounted to some 200 million units. Sir Stafford operated personally, under the guidance of Mr. "Tony" Vandervell, several of the machines on the production lines.

"GAS WORKS" ON WHEELS

IT can now be disclosed, says the Ministry of Aircraft Production, that throughout the blitz and the attacks of flying bombs, provision was made for the immediate supply of gas to any war production factory, the efficiency of which had been impaired by the sudden loss of gas production. Trailers with gas cylinders and pressure-reducing equipment were held at strategic points throughout the country.

Any sudden increase of seasonal demands beyond the capacity of any local gas undertaking could be met.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers not necessarily for publication, must in all cases accompany letters.

THE MILES M.48

Amazingly High Lift Coefficient

THE Miles M.48 illustrated and briefly described in *Flight*, April 12th, seems to have solved all our aerodynamic "headaches" in trying to obtain a high C_L maximum. Numerous experiments, both model and full scale, have been made in trying to obtain a maximum lift coefficient of over 3, and most of the schemes involve the use of multi-slotted flappery, using the full span of the wing.

The stalling speed of 25 m.p.h. on the wing loading of 12.5 lb./sq. ft. implies that Mr. Miles, using an auxiliary aerofoil extending over half the span, has achieved the amazing value of 7.8. Even assuming that the flaps give a considerable increase in wing area, the lift coefficient is still more than twice as much as anyone else has yet achieved.

This achievement is surely a landmark in the history of aerodynamics, and however modest Mr. Miles may be, it seems that such an achievement of aerodynamic skill should be given the fullest possible publicity.

A. A. BAGE, A.F.R.Ae.S.,
Chief Designer, Percival Aircraft, Ltd.

THE PRICE PAID

No Question of a Paramount Service

MANY persons who have retained a sense of proportion will deplore your comments in paras. 4 and 5 of your leading article of April 12th which revive a stale and outmoded controversy, which they had hoped had been relegated to the armchairs of elderly club members. Surely, if any lesson has been learnt this war, it is that each Service is the brother-in-arms of the other two and that there is no question of paramountcy. Each has its own part to play, and who can question that the role of each has been essential to the full functioning of the other two?

The sinking of the *Tirpitz* was a poor example to quote in support of your argument, for if she had not been damaged and practically immobilised by the midget submarines, do you really think that she would have remained in the exposed and unprotected anchorage where she was sunk? Moreover, if a battleship is so easily disposed of, as your article suggests, why was she not sunk earlier?

Finally, a battlehip is expected to last twenty-five years in peace. The cost of a bomber squadron and its reserve aircraft for this period does not fall far short of the cost of a battleship.

The Services understand the motto "United we stand, divided we fall." A properly balanced scheme of defence is vital, but it will not be attained until old, outworn prejudices on all sides have been discarded. E. A. TURNER.

[Unless our correspondent can design a battleship which will never need to go into a dockyard he will find the answer to his letter in the lower photograph on page 439.—ED.]

BOOST AIR TRAVEL

What "This Sleepy Country" Needs

I DO not profess to be an expert in the science of aeronautics, but I had the honour of serving in the Royal Flying Corps during the last war. My technical qualifications were, and still are, practically nil—but in those days I was only one of many. We who earned the honour to fly and fight as members of that wonderful Corps were imbued with a spirit and a faith, and our love of flying was sufficient to outweigh any failings in other directions. We learned our flying on Maurice Farmans (Old Rumpety), Avros and D.H.6s (Crab), and we did not have panels garnished with innumerable instruments to be consulted and to worry over.

I have not flown since my demob. in 1919, much to my regret. This has not been due to lack of interest, but to lack of opportunity and the financial wherewithal. I have followed the various developments in aeronautics through the pages of *Flight*, and I am just as enthusiastic to-day as I was when I first learned the art of flying. I believe that the air way is the finest mode of transport man can desire, and it has in the past appalled me to see the apathy with which we British have handled air transport and flying in general. The ordinary folk of Britain are just not interested in air travel, and for this I lay the blame on the shoulders of our various governments who have not only restricted the growth of the R.A.F., but have also burdened civil flying with a deadening hand. Flying is looked upon by the great mass of people as too expensive and too dangerous. If the civil air transport organisations in the past had been given full government backing they would have been able to put in the air the finest machines in the world and to have launched a nation-wide publicity campaign to make the general public "air conscious," finally bringing the cost within reach of everybody who wanted to fly. As for the danger—it is no greater than the dangers of road or rail travel.

What we need in this sleepy country is competition between, and freedom for, independent air transport operators who would, of course, first be required to satisfy an independent panel of experts on all points as to their ability to operate airways travel. Let the Government give them, if necessary, initial backing and not confine the air to a monoply.

Rail and road transport will not be superseded because millions will still prefer this method, but air travel would, I contend, come into its own and pay its way.

J. BARNETT.

JET AND TURBINES

Calculating Fuel Consumption

I WAS very interested to read Mr. P. A. Hearne's notes on jet propulsion in *Flight*, April 12th, since the same questions which he poses have also occurred to me, and I would like to put forward what seem to me to be the solutions.

The clue to the first question may be seen in the lower diagram on page 394, which shows that the propulsive force is exerted on the front face of the combustion chamber. Just what shape and position the latter takes depends on the individual design, and since no details of the "innards" of any of the successful jet engines have yet been released, we must just bide our time in patience until Max Millar can get to work.

We can see, though, that the parts which will have to be stressed will be those attaching the combustion chamber to the external shell of the jet unit, and thence to the mountings attaching the unit to the aircraft structure, so that these mountings will have to be stressed in the same manner as those of a normal aircraft engine.

Secondly, since the combustion chamber is usually annular and co-axial with the turbine-compressor shaft, the thrust will act equally all round the front face of the combustion chamber, and therefore the thrust line will lie along the axis of the shaft.

To find the answer to the last question we must remember the formula in elementary mechanics which says that

$$\text{H.P. developed} = \frac{F.V}{550},$$

where F = force exerted (lb.),
V = velocity at which force is moving (ft. per sec.)

This at once shows us that the power developed by the engine of a jet-engined aircraft depends directly on its forward speed (assuming that the jet develops a constant thrust), and this accounts for the low efficiency at low speeds of this type of aircraft. It is obvious, therefore, that no figure for fuel consumption can be given unless the speed is specified, the conversion formula being as follows:

Let T = thrust of jet unit, lb. (assumed constant).
V = velocity of aircraft, m.p.h.
W = weight of fuel consumed per hour, lb.

$$\text{Then H.P. developed} = \frac{TV}{550} \times \frac{88}{60} = \frac{TV}{375},$$

and fuel consumption, in lb./H.P. hour

$$= W \div \frac{TV}{375} = \frac{375W}{TV}$$

This formula is purely theoretical, and would naturally be somewhat inaccurate in practice, but it is sufficient to give a rough idea of the fuel consumption.

As an example, let us consider a hypothetical aircraft having a single jet-propulsion unit which consumes 1,000 lb. of fuel per hr. at 375 m.p.h. at sea-level, and exerts a constant thrust of 1,000 lb. at that speed and height.

Then, from the formula,

Fuel consumption =

$$\frac{375 \times 1{,}000}{1{,}000 \times 375} = 1 \text{ lb./h.p. hour,}$$

i.e., about 2½ times the consumption of a piston engine, a reasonable figure at the present stage of development.

S. H. W. PRINCE.

ORIENTAL ELEGANCE : Burmese Christian ladies visiting a Hurricane bomber squadron. They brought presents of eggs and fruit for the pilots.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Bar to Distinguished Service Order

Act. Group Capt H. S. L. DUNDAS, D.S.O., D.F.C., A.A.F.—Since the award of the Distinguished Service Order, Group Capt. Dundas has led a large number of operational sorties, many of which have been extremely difficult and hazardous missions. He has played an important part in developing the technique of low-level cannon and machine gun attacks in adverse weather for the close support of forward troops. In December, 1944, he led three formations of Spitfire aircraft, in extremely poor visibility, to attack enemy positions in the Bagnacavallo area. The nearest point of the attack was less than 100 yards from our forward troops. The operations were so successful that the Canadian attack which followed immediately captured the position with only slight losses. Excellent results have been achieved in many other attacks led by Group Capt. Dundas. His judgment, keenness and courage have been outstanding on all occasions.

Act. Group Capt. W. G. G. D. SMITH, D.S.O., D.F.C., R.A.F.V.R.—Following a fine record in Fighter Command, Group Capt. Smith has led a fighter wing in the invasion of Sicily and in operations over Southern Italy. The high measure of success achieved by the squadrons under his command has been largely attributable to the boldness and soundness of his leadership. Since he took over command of his wing, 85 enemy aircraft have been destroyed in combat and many others damaged. Group Capt. Smith has taken an important part in the successes thus achieved. He has destroyed in all 14 enemy aircraft and a large number of transport vehicles and locomotives. As an operational commander, Group Capt. Smith has rendered extremely valuable and devoted service.

Distinguished Service Order

Act. Wing Cdr. D. M. BRASS, R.A.F.O., No. 612 Sqn.—Wing Cdr. Brass has a long record of operational flying. He has completed two tours of operational duty. Since June, 1943, he has commanded his squadron and has participated in numerous anti-shipping and U-boat patrols, often during adverse weather. This officer has always displayed outstanding leadership and devotion to duty. On five occasions he has flown his aircraft safely back to base on one engine. He has been employed on operational flying since the outbreak of war and has set a very high standard of morale and keenness.

Act. Wing Cdr. P. H. WOODRUFF, D.F.C., R.A.F.O. (since deceased).—This officer has shown the very highest qualities of leadership, courage and devotion to duty. He has led his wing on numerous hazardous missions, and on these sorties has shared in the destruction of two Heinkel 111s on the ground and at least two complete trains, 11 engines and many other railway and transport vehicles. His determination in pressing home his attacks against ground targets defended by extremely intense and accurate anti-aircraft fire has instilled confidence in the pilots of the squadron and has resulted in a high standard of efficiency and morale. He has, by his tireless energy, courage and sense of responsibility made a very marked contribution to the successes attained against the enemy.

Act. Sqn. Ldr. J. E. ORAM, R.A.F.V.R., No. 40 Sqn.—Sqn. Ldr. Oram has completed his second operational tour, operating from North Africa and subsequently from Italy. He has been employed both as navigator and bomb aimer, setting a fine example of skill and courage on all occasions. Sqn. Ldr. Oram's extremely accurate navigation did much to secure the success of an important attack on the Reggio Emelia aircraft factory in January, 1944, and in October, 1944, he led a particularly daring mine-laying operation to the river Danube. As a flight commander, Sqn. Ldr. Oram has shown outstanding powers of leadership, courage and devotion to duty. He has applied his wide knowledge and experience to the training of new crews with outstanding success.

Badge of No. 140 Squadron, R.A.F. "Foresight."

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. A. P. Q. BLUETT, D.F.C., R.A.F., No. 112 Sqn.—The results achieved by Sqn. Ldr. Bluett's squadron have been exceptionally good and have been the direct outcome of his fine leadership. In addition to attacks on enemy guns and defended positions in close support of the troops, he has led formations on armed reconnaissance and against enemy transport. In September, 1944, his formation sank a small merchant ship, destroyed 12 locomotives, two oil trucks and damaged nine enemy aircraft on the ground during one such sortie. Sqn. Ldr. Bluett has also taken part in attacks on railways in Italy and Yugoslavia which have resulted in much damage and disruption of communications. His leadership, daring and determination have been of great value to his squadron.

Badge of No. 158 Squadron, R.A.F. "Strength in Unity."

Act. Sqn. Ldr. P. L. PARROTT, D.F.C., R.A.F.O., No. 72 Sqn.—Sqn. Ldr. Parrott is now engaged on his second operational tour in the Mediterranean area. He has also completed a previous tour from England. Since the award of the Distinguished Flying Cross he has completed numerous sorties and has destroyed at least one enemy aircraft. He has led his squadron with skill and determination. During the landing at Anzio, his formation engaged and drove off a large number of enemy fighter-bomber attacks, contributing materially to the successes achieved by his squadron. In all, Sqn. Ldr. Parrott has destroyed at least six enemy aircraft.

Distinguished Flying Cross

Sqn. Ldr. J. C. GRAHAM, R.A.F.O., No. 206 Sqn.
Act. Sqn. Ldr. P. J. B. BAGSHAWE, R.A.F., No. 250 Sqn.
Act. Sqn. Ldr. J. E. BROWN, R.A.F.V.R., No. 267 Sqn.
Flt. Lt. N. BARRETT, R.A.F.V.R., No. 267 Sqn.
Flt. Lt. W. DAWSON, R.A.F.V.R., No. 517 Sqn.
Flt. Lt. A. R. GRAHAM, R.A.F.V.R., No. 542 Sqn.
Flt. Lt. E. J. SAVILL, R.A.F.V.R., No. 235 Sqn.
Flt. Lt. A. SWAIN, R.A.F.V.R., No. 58 Sqn.
Flt. Lt. A. R. BALL, R.A.F.V.R., No. 35 Sqn.
Act. Flt. Lt. S. E. DRINKWATER, R.A.F.V.R., No. 455 (R.A.A.F.) Sqn.
F/O. G. R. ADAMS, R.A.F.V.R., No. 178 Sqn.
F/O. J. FILSON, R.A.F., No. 1435 Sqn.
Flt. Lt. R. H. FRY, R.A.F.V.R., No. 104 Sqn.
F/O. R. J. GREENFIELD, R.A.F.V.R., No. 93 Sqn.
F/O. J. F. SAMSON, D.F.M., R.A.F., No. 540 Sqn.
F/O. L. TRIGG, R.A.F.V.R., No. 38 Sqn.
F/O. J. WATKINS, R.A.F., No. 502 Sqn.
F/O. D. F. WHITE, R.A.F.V.R., No. 241 Sqn.

SERVICE

P/O. L. F. BEECHER, R.A.F.V.R., No. 37 Sqn.
P/O. R. J. A. CHURCH, R.A.F.V.R., No. 4 Sqn.
P/O. R. H. B. EAMES, R.A.F.V.R., No. 236 Sqn.
P/O. J. E. LOUGHRAN, R.A.F.V.R., No. 267 Sqn.
P/O. T. C. SHIEL, R.A.F.V.R., No. 37 Sqn.
P/O. A. H. SMITH, R.A.F.V.R., No. 236 Sqn.
W/O E. H. SKINNER, R.A.F.V.R., No. 97 Sqn.
Act. W/O. A. R. WILDEN, R.A.F.V.R., No. 100 Sqn.
Capt. C. G. LE ROUX, S.A.A.F., No. 40 Sqn.
Capt. A. W. MEIKLE, S.A.A.F., No. 7 (S.A.A.F.) Sqn.
Capt. F. K. WEINGARTZ, S.A.A.F., No. 250 Sqn.
Capt. C. A. D. WILLIAMS, S.A.A.F., No. 541 Sqn.
Lt. C. R. BAURISTHEME, S.A.A.F., No. 40 (S.A.A.F.) Sqn.
Lt. L. G. BURRELL, S.A.A.F., No. 15 (S.A.A.F.) Sqn.
Lt. A. H. HARPER, S.A.A.F., No. 15 (S.A.A.F.) Sqn.
Lt. R. J. JOOSTE, S.A.A.F., No. 15 (S.A.A.F.) Sqn.

Distinguished Flying Medal

Flt. Sgt. J. G. ASHTON, R.A.F.V.R., No. 90 Sqn.
Flt. Sgt. J. H. MONK, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. D. J. PARKER, R.A.F.V.R. No. 186 Sqn.
Flt. Sgt. G. S. PAYNE, R.A.F., No. 7 Sqn.
Flt. Sgt. A. PETERS, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. S. R. E. BAYNES, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. R. W. BELL, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. H. C. E. BOX, R.A.F.V.R., No. 571 Sqn.
Flt. Sgt. A. F. BROWN, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. D. A. COLE, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. R. M. COLLINS, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. G. CONN, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. N. D. COTTLE, R.A.F.V.R., No. 195 Sqn.
Flt. Sgt. T. G. P. CRUICKSHANK, R.A.F., No. 166 Sqn.
Flt. Sgt. T. J. CUNNINGHAM, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. F. A. J. DAVID, R.A.F.V.R., No. 571 Sqn.
Flt. Sgt. J. W. EMMS, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. L. FELLOWS, R.A.F.V.R., No. 622 Sqn.
Flt. Sgt. D. D. FINLAY, R.A.F.V.R., No. 429 (R.C.A.F.) Sqn.
Flt. Sgt. (now P/O.) J. GRICE, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. B. T. R. GRIFFITHS, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. A. HARRISON, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. I. C. HEATH, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. R. J. HEATRICK, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. G. C. HEYWOOD, R.A.F.V.R., No. 12 Sqn.
Flt. Sgt. (now P/O.) N. W. HILL, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. E. HILTON, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.
Flt. Sgt. D HOLDEN, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. C. V. HOOPER, R.A.F.V.R., No. 692 Sqn.
Flt. Sgt. W. H. HOPEWELL, R.A.F.V.R., No. 622 Sqn.
Flt. Sgt. J. C. JARVIS, R.A.F.V.R., No. 102 Sqn.
Flt. Sgt. J. D. KIRK, R.A.F.V.R., No. 635 Sqn.
Flt. Sgt. A. LEWIS, R.A.F.V.R., No. 582 Sqn.
Flt. Sgt. R. R. D. MATTHEWS, R.A.F.V.R., No. 578 Sqn.
Flt. Sgt. P. MCGOWAN, R.A.F.V.R., No. 195 Sqn.

THE KING has been graciously pleased to approve the following awards:—

B.E.M. (Mil.)

Cpl. F. BATTERSBY, R.A.F.V.R. (since deceased).—In October, 1944, Cpl. Battersby and six other airmen commenced work at a town in Belgium on the clearance of hotels and houses required for occupation by the Royal Air Force. They were engaged in buildings comprising about 1,000 rooms and the enemy had drawn the window shutters and removed the electric lighting system. The party worked with hand torches. On the following day three of the party were badly injured and a fourth member received severe shock from the explosion of a charge which was detonated by the fouling of a concealed trip wire. Cpl. Battersby took charge of the remaining members of the party until the arrival of his flight commander, and continued the work until 14.00 hours on the seventh day, when the hotels were finally cleared. During this period 80 enemy mines and prepared charges, ingeniously hidden and laid to be functioned by one or more trip wires, were recovered, neutralised and disposed of. On a previous occasion Cpl. Battersby was required to continue this form of work after casualties had occurred among his party. He has displayed high courage and leadership.

Cpl. H. W. GREENBANK and L.A/C. F. PONSONBY, both of No. 208 Sqn.—One night in October, 1944, three aircraft crashed when attempting to land at an airfield on an improvised flare path, formed by trucks placed along the runway. The aircraft which first came in to land crashed into a truck, injuring the driver and killing an officer standing thereby, and immediately burst into flames. Cpl. Greenbank and the fire crew under his charge got the fire under control and were attempting to rescue the pilot when a second aircraft collided with the first aircraft and also burst into flames, striking Cpl. Greenbank as it landed. Ignoring his injuries and the fact that other aircraft were heading for the scene of the crash, he extinguished the second fire and then extricated the pilot of the first aircraft. As he did so the third aircraft crashed over the heads of the rescuers. Meanwhile L.A/C. Ponsonby, an ambulance driver, had been attending to the driver of the truck on which the first aircraft had crashed. The latter had been trapped in his vehicle with fractures of both legs. Despite the fact that the two other aircraft were heading for the scene he towed the truck away in time to avoid a collision. Cpl. Greenbank saved the life of a pilot and averted the total destruction of two aircraft, whilst L.A/C. Ponsonby saved the life of the driver of the truck. They displayed courage in dangerous circumstances. On previous occasions both had shown devotion to duty and courage of a high order.

(Left) Badge of No. 514 Squadron, R.A.F. "Nil Obstare Potest" (Nothing can Withstand). (Right) Badge of No. 89 Squadron, R.A.F. "Dei Auxilio Telis Meis" (By the help of God with my weapons.)

Roll of Honour

Casualty Communiqué No. 494.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 175 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. E. Ashworth; Sgt. J. A. Carter; Flt. Sgt. N. L. T. Day; P/O. E. T. Gillingham; F/O. W. T. Kerr; Sgt. A. F. Langstone; F/O. M. J. Lovett; Sgt. A. Muttock; Sgt. J. Nicholls; Sgt. F. D. M. Smith; Sgt. J. W. Thorne; F/O. D. A. Weare, D.F.C.; Sgt. J. Wyper.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. L. H. Baldwin; Sgt. W. F. Burkitt; Sgt. E. T. W. Byford; Sgt. D. T. Cash; Ft. Sgt. W. E. Cocks; F/O. F. Cueto; P/O. R. Downing; Flt. Sgt. A. Finch; F/O. J. W. Hearn; F/O. A. E. Manning; Sgt. J. A. Morris; Flt. Lt. F. Musgrove; W/O. H. E. Parsloe; Group Capt. N. C. Pleasance; Flt. Sgt. T. Ratcliffe; Flt. Sgt. C. R. Seaman; Flt. Lt. N. Stewart; Sgt. A. L. Taylor; Sgt. J. P. Taylor; Sgt. H. C. Webb; Sgt. W. V. Willson; Sgt. J. J. Zammit.

(Left) Empire Central Flying School badge. "Aequora Dividunt Conjungit Cælum" (The seas separate, the sky unites). (Right) Badge of No. 67 Squadron, R.A.F. "No odds too great."

AVIATION

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. A. Allison; F/O. W. V. Amphlett; F/O. E. Anderson; Sgt. T. Arnold; F/O. D. A. Bacon; F/O. R. P. McM. Bagg; F/O. D. R. Barham; Sgt. A. N. Blenkarn; P/O. B. Bolsworth; F/O. I. M. Bremner; F/O. A. R. Broadbent; Flt. Sgt. D. I. Bruce; Flt. Sgt. D. E. V. Bunting; Sgt. S. W. Bury; Sgt. C. Butson; Flt. Sgt. L. A. Chapman; Sgt. D. Charlton; P/O. W. A. Clegg; F/O. R. T. Cochrane; Sgt. F. C. Collins; Flt. Lt. R. Crease; F/O. A. P. Cummins; Flt. Sgt. K. Dadds; Sgt. L. G. Darben; Sgt. J. McD. Davies; P/O. H. T. Ellis; W/O. E. S. I. Evans; F/O. I. G. Evans; Sgt. K. E. Evans; Sgt. K. Farmer; Sgt. C. W. Farrant; Sgt. P. O. Fenner; Flt. Lt. N. H. Fredman; Sgt. N. Graham; Sgt. W. M. Gray; Sgt. W. D. Hall; Sgt. G. Hampton; F/O. F. W. Harding; Flt. Sgt. L. C. Hartman; W/O. R. Haywood; Sgt. J. Hendry; F/O. D. G. J. Higgs; Sqn. Ldr. F. P. Hill; Flt. Sgt. F. Hobbs; F/O. G. V. Holmes; Sgt. W. H. Holmes; Sgt. B. V. Howard; Flt. Sgt. E. F. Howe; Flt. Sgt. P. R. Hughes; F/O. D. G. W. Humphreys; P/O. D. A. Hyne; Flt. Sgt. E. R. Jacobs; Flt. Sgt. G. E. Jagger; F/O. S. G. Joiner; F/O. B. C. Jones; Sgt. W. R. Jones; Sgt. K. S. Joslyn; Sgt. W. C. W. King; Sgt. R. F. Laishley; Sgt. J. E. Laughlin; Flt. Lt. A. T. Lawson-Tancred; Sgt. D. G. Lax; Flt. Lt. R. G. Layley; Sgt. S. A. Lewis; Sgt. D. S. Lindsay; Sgt. H. Longton; F/O. D. B. McIntosh; F/O. R. A. Milne; Flt. Sgt. J. L. Miriams; F/O. H. D. G. Morris; Sgt. J. A. Morrish; Sgt. W. A. Munday; P/O. R. W. Newcomb; P/O. F. L. Newstead; Sgt. D. R. Oliver; Sgt. R. S. Parmenter; Flt. Lt. G. A. Procter; Sgt. S. H. Rattray; P/O. G. C. Reed; Sgt. G. T. W. Reynolds; Sgt. G. Richards; P/O. J. N. Richards; Sgt. J. M. H. Rocheecouste; Flt. Lt. T. W. Rowland, D.F.C.; P/O. R. A. Simmons; Flt. Sgt. R. Soo; Sgt. A. E. Spencer; Flt. Sgt. A. W. Stein; Sqn. Ldr. H. B. Stephens, D.F.C.; Sgt. E. T. E. Sullivan; Sgt. R. E. Swann; Flt. Lt. B. L. Thornton; Sgt. W. S. Travers; Flt. Sgt. G. W. Trodd; F/O. R. G. Wallis; Sgt. G. A. Walton; Sgt. R. S. Watson; Sgt. S. H. Weldon; Flt. Lt. R. B. Wharmby; P/O. D. W. Whiffin; Flt. Sgt. L. H. Whitear; Sgt. G. H. Williams; Sgt. J. C. Williams; F/O. D. T. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW REPORTED KILLED IN ACTION.—Sgt. C. J. Parkinson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. D. W. O'Dell.

WOUNDED OR INJURED IN ACTION.—Sqn. Ldr. J. H. Simpson, D.F.C.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. F. J. Angus; Flt. Lt. F. G. Grillage; F/O. E. G. Hill; Flt. Lt. J. C. Horlock; Flt. Lt. J. T. W. Morris; Flt. Sgt. J. O'Callaghan; W/O. F. H. Rapley; Sgt. J. G. Robinson.

MISSING.—Sgt. P. Banks; Sgt. A. Blanchard; Flt. Sgt. E. D. Brick; W/O. J. K. Brill; F/O. J. P. Brooksbank; Sgt. E. C. Charles; F/O. P. W. Christopherson; Sgt. I. R. Clapton; Sgt. C. N. Collingwood; Flt. Sgt. S. Easton; F/O. C. Entwistle; Flt. Sgt. E. E. Evans; Sgt. F. O. Fisher; P/O. J. Fletcher; Sgt. J. Forward; Sgt. H. Fowler; Sgt. G. A. C. Frizzel; F/O. M. Gisby; Sgt. S. Goodier; Flt. Lt. G. W. Green; F/O. H. H. S. Gwyer; F/O. J. E. C. Hardy; Sgt. L. J. Hart; Sgt. R. W. Henson; Sgt. W. C. Higginbotham; F/O. J. Hindle; Flt. Lt. F. H. Holmes; F/O. P. A. Hughes; Sgt. W. J. R. Jeffree; Sgt. D. R. Jones; Sgt. K. Jones; F/O. L. A. Kessler; Flt. Sgt. R. J. Ketley-Rolph; F/O. J. Kinman; Sgt. R. S. McKillop; Flt. Sgt. P. D. Mann; Sgt. H. Mawson; F/O. W. A. Nicholls; Sgt. R. G. Nuttall; Sgt. E. S. Pattison; Flt. Sgt. A. L. Plimmer, D.F.M.; P/O. T. D. S. Rabbitts; F/O. W. Riddell; Sgt. J. A. Rudd; Sgt. J. Scott; F/O. J. N. L. Scott; F/O. J. A. Shortis; Sgt. J. W. M. Slaven; Sgt. J. H. Smith; Sgt. W. Snowden; Sgt. H. Stobart; Sgt. R. M. Swinbank; Flt. Sgt. S. C. Trevis; Sgt. R. V. Wakefield; Flt. Sgt. J. H. Walter; P/O. T. N. Watson; F/O. G. R. E. Weir; F/O. E. A. Welch; Sgt. S. A. Westcott; Sgt. E. Wilcox; Sgt. H. R. Williams; Sgt. J. Williams; Flt. Sgt. S. J. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—L.A/C. J. Ambler; L.A/C. A. W. Hawkes; W/O. R. J. Taylor.

KILLED ON ACTIVE SERVICE.—L.A/C. A. F. Allen; L.A.C. J. Boyd; F/O. D. H. Christophers; L.A/C. H. Clotworthy; Flt. Sgt. P. G. Cocklin; Flt. Sgt. A. J. W. Farrer; L.A/C. I. E. C. Ghey; W/O. P. F. Higgins, D.F.M.; Sgt. T. C. Jones; L.A/C. A. J. Manaton; Sgt. J. W. Melhuish; Cpl. D. Mullaugh; Sgt. M. A. Oehrli; Flt. Sgt. W. K. Owens; Sgt. K. R. Ridehalgh; Sgt. F. A. Samways; Sgt. J. Venus; L.A/C. W. Wood.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. C. S. McG. Averill; Sgt. J. Bull; Sgt. R. C. Cox; Sgt. G. Hodgson; F/O. F. B. Knighton; Sgt. E. K. J. Potter; Sgt. J. H. Stafford.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. M. C. Barnard; Sgt. J. Gate; Sgt. J. G. Fulton; Sgt. D. E. Telling; F/O. G. W. Wright.

SERVICE AVIATION

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. T. Barlow.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. C. P. Barlow; P/O. J. Bull; Flt. Lt. A. A. Fox; F/O. W. Graham; LA/C. T. Heaton; F/O. L. R. Hooper; P/O. G. Lock; L.A/C. W. H. Stevens; L.A/C. F. H. Walker.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. J. Boulton; L.A/C. J. Burgon; L.A/C. D. H. Davies; Sgt. M. Schneider.

DIED ON ACTIVE SERVICE.—Cpl. S. G. Ash; L.A/C. R. Berry; L.A/C. F. J. Cain; A/C.2 J. Cowan; Cpl. J. Foster; Cpl. R. J. Lingwood; L.A/C. W. C. Millar; Sgt. H. Mills; Sgt. D. T. Nichols; L.A/C. A. A. Pegg; Cpl. L. Pratt; Cpl. T. F. Reynolds; Cpl. A. Ridpath; A/C.2 O. E. Riley; Sgt. P. G. Russell; L.A/C. J. A. Walsh.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. W. W. Cottam; Flt. Sgt. P. Coyne; Sgt. J. A. Davies; Sgt. R. P. Gigg; F/O. K. G. J. Gratton; W/O. A. J. Holden; P/O. H. Matthews; Flt. Lt. T. W. Warwick.

Royal Australian Air Force

KILLED IN ACTION.—W/O. A. K. Jenkins; Flt. Sgt. J. B. Maloney.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. D. F. Constable, D.F.C.; Flt. Sgt. E. A. Glover.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. W. J. Allan; Flt. Sgt. B. P. Doyle; P/O. W. N. W. Brown; F/O. J. C. Grainger; Flt. Sgt. H. W. Pronger; Flt. Sgt. G. E. Shook; F/O. R. S. Yell, D.F.C.

MISSING, BELIEVED KILLED IN ACTION.—F/O. F. E. Sorensen.

MISSING.—F/O. K. E. H. Bennett; F/O. K. C. Beruldsen; Flt. Sgt. F. A. Black; P/O. R. W. Byrnes; P/O. R. E. R. Fountain; Wing Cdr. L. V. Hudson; Flt. Sgt. N. F. D. McGladrigan; Flt. Sgt. B. J. O'Donnell; F/O. J. H. Ogilvie; P/O. R. E. Roberts; Flt. Lt. D. J. Wilson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. P. Angus; Flt. Sgt. J. M. Irvine; Flt. Sgt. A. M. McPhail; Flt. Sgt. G. T. Miller; Flt. Sgt. R. D. Westphal.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. P. O'Donnell; Flt. Sgt. T. R. Cooke.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. A. W. Holmes; Flt. Sgt. W. E. Lucas.

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. A. G. Baxter; F/O. E. E. Cooper.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. C. R. Byers; Flt. Sgt. G. J. Dale; Sgt. W. J. Gerow; F/O. J. A. Horsfall; W/O. P. G. Jolliffe; Flt. Lt. S. W. Matthews; P/O. D. E. Stiver; Sgt. E. F. Uren; Flt. Sgt. G. R. M. Warren.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. Knoke; P/O. R. E. Vandette.

MISSING.—P/O. K. C. Christian; Flt. Sgt. G. P. Coughlin; Sgt. J. M. De Macedo; F/O. H. W. Johnson; F/O. T. Kowalchuk; W/O. D. H. Lavalley; F/O. S. W. Pechet; Flt. Sgt. V. E. Prouse; F/O. J. Reid; Flt. Lt. H. A. Shewfelt; F/O. N. F. Smith; Flt. Sgt. J. E. Virag.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. E. E. Muffitt.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. V. C. Pockson.

MISSING, BELIEVED KILLED IN ACTION.—F/O. A. O. Ellis.

MISSING.—F/O. M. A. Milich.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. J. A. Penney.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. D. J. Reid.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. O. Dixon; Flt. Sgt. J. T. Elder.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. R. J. Marsh.

South African Air Force

KILLED IN ACTION.—Lt. B. D. Mair.

Casualty Communiqué No. 495

Of this list 184 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—W/O. W. A. Bates; Sgt. E. Berry; F/O. A. V. Donkin; F/O. J. N. Edwards; Sgt. C. Jackson; Flt. Sgt. J. A. Jones; Flt. Sgt. E. G. Rawley; Flt. Sgt. L. G. Roberts; Flt. Lt. W. Taylor; Sgt. R. Thomas; Sgt. T. W. Worthington.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. T. C. Baker; Flt. Sgt. J. S. Barker; Flt. Sgt. J. G. Belec; Sgt. F. S. Bodkin; Sgt. J. Clark; Flt. Sgt. A. G. Drake; Sgt. F. Eland; Flt. Sgt. L. A. Everett; P/O. W. R. Glaysher; Sgt. G. W. Jeffery; Flt. Sgt. D. R. Neal; Flt. Lt. R. J. Owen; P/O. G. A. Pope; F/O. J. M. Row; Sgt. D. Rowcliffe; Sgt. C. Seddon; Sgt. R. Shelton; Sgt. S. G. Silver; Sgt. J. M. Smith; Sgt. L. A. Taylor; P/O. R. C. Thornton; Sgt. A. Tuffs; Sgt. L. E. Walford; Sgt. J. Webb; Sgt. D. C. Youngs.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. R. Adams; Flt. Sgt. R. A. Adams; Sgt. R. H. Aiano; Sgt. A. Allison; Flt. Sgt. D. A. Arthur; Sgt. D. F. Bache; Sgt. A. Bell; Sgt. F. P. Bramley; Sgt. C. V. Byatt; Sgt. B. G. Capel; Sgt. J. H. Carr; Sgt. J. S. Child; Flt. Sgt. T. H. Clark; Flt. Sgt. C. Cook; Flt. Sgt. G. S. Davies; F/O. W. H. Davies; P/O. S. Dawson; P/O. R. A. Deacon; F/O. G. L. Downer, D.F.C.; Flt. Sgt. K. E. L. Farmelo; Sgt. C. E. R. Fox; Sgt. H. Graham; Flt. Sgt. W. G. Handcock; Flt. Sgt. H. L. James; F/O. W. K. James; Sgt. E. G. Johnson; Flt. Sgt. C. J. Jones; F/O. J. H. Kingsbury; Flt. Sgt. P. H. Lamprey; Sgt. W. Lindsay; Flt. Sgt. J. W. Love; Sgt. J. McCrevey; Flt. Sgt. E. D. MacPherson; Sgt. J. McSpadyen; F/O. J. B. Marshall; Sgt. E. Martin; Flt. Sgt. T. D. Meigh; Sgt. E. R. R. Moulding; Sgt. P. J. E. Moxey; F/O. C. E. Peake; Flt. Sgt. M. S. Pearson; Flt. Sgt. D. J. Phelan; Sgt. W. Pickering; P/O. R. H. Pitman; Sgt. G. E. Powell; F/O. J. Puver, Flt. Sgt. S. W. Rayner; Sgt. S. G. Rees; Sgt. J. Richardson; Flt. Lt. W. G. Ross; Sgt. A. W. Sherwood; P/O. W. G. J. Shields; P/O. F. R. Smith; Sgt. J. J Smith; Flt. Sgt. J. F. Stanley; Flt. Sgt. B. Stavert; P/O. R. R. J. Tate; P/O. R. S. Thompson; F/O. R. E. S. Twining; Sgt. G. Upfold; Flt. Lt. R. A. Vinson; Flt. Sgt. J. Wadsworth; Sgt. G. L. Waters; Flt. Lt. G. A. Welch; P/O. N. E. West; Sgt. C. F. Wheatstone; Sgt. R. G. Whitmarsh; Sgt. A. W. Woodcock; F/O. G. W. Yerby; Flt. Sgt. W. H. Yuill.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. S. Hope.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. J. A. Don Fox; Sgt. C. J. Small.

MISSING, BELIEVED KILLED IN ACTION.—F/O. H. Stevenson.

MISSING.—Sgt. H. Ainley; Wing Cdr. R. A. Atkinson, D.S.O., D.F.C.; F/O. E. H. Baron; Flt. Sgt. J. G. Beardshaw; Flt. Sgt. R. J. Bowen; Flt. Lt. D. S. Buckie; F/O. A. B. Campbell; F/O. C. W. Cassini; F/O. P. J. Cowgill, D.F.C.; F/O. P. F. Croft; F/O. H. S. Davis; Flt. Lt. P. C. Dravers; F/O. K. J. Edmunds; Sgt. R. Eggleston; Flt. Lt. R. G. Elvin; F/O. A. C. Everett, D.F.M.; F/O. J. C. Goodacre; Flt. Sgt. P. C. Green; Flt. Sgt. R. Hall; Flt. Sgt. F. A. Hawkins; F/O. A. H. Hebblethwaite, D.F.C.; W/O. H. W. J. Hildebrand; Sgt. R. C. Hitchen; Flt. Sgt. J. S. Hogg; Sgt. R. Holden; Flt. Sgt. S. R. Hunt; W/O. T. L. Jackson; Flt. Sgt. H. B. Jones; F/O. H. N. T Medrington; F/O. L. Milner; Flt. Sgt. G. R. Morris; F/O. A. E. Nevard; Flt. Lt. C. P. O'Connor; F/O. D. H. Over; W/O. H. R. F. Partridge; Flt. Lt. J. Paton; Flt. Sgt. D. M. Pearce; W/O. H. C. Porter; Flt. Lt. M. S. F. Pritchard; Flt. Lt. E. Rayner; W/O. H. W. Read; Sgt. K. S. Riley; Sgt. S. Robinson; F/O. C. Sanders; Flt. Sgt. C. Shaw; Sgt. E. W. Skipper; W/O. C. Smith; F/O. D. T. Tull, D.F.C.; Sgt. F. J. Turkentine; F/O. B. M. Twilley; F/O. V. C. Upton; Sgt. H. W. Wagner; Flt. Lt. A. W. Walker; F/O. W. Warhurst; F/O. B. E. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—P/O. W. D. Livock; L.A/C. W. C. Munday; Flt. Sgt. G. L. West.

KILLED ON ACTIVE SERVICE.—F/O. J. H. W. Addington; Cpl. C. R. Akass; F/O. E. T. Anderton; F/O. S. B. J. L. Austin; Flt. Lt. G. Bent; F/O. E. A. Bunting; Sqn. Ldr. F. A. J. Burrows; Sgt. M. Bury; Flt. Lt. S. G. Cockburn; F/O. R. N. Coleby; Sgt. J. O. Edwards; Flt. Sgt. A. A. Fairweather; L.A/C. J. Francis; F/O. D. R. Catward; F/O. A. F. Green; L.A/C. P. M. Green; F/O. G. T. Griffith; Sgt. A. P. T. Henry; A/C 1 M. H. Leslie; P/O. A. M. MacGregor; F/O. C. L. Makewell; Sgt. W. O. Mountain; Cpl. R. Regan; Sgt. J. W. Salmon; L.A/C. A. F. Sparrow; F/O. E. R. Turvey; F/O. T. M. Watson; L.A/C. L. Wilkins; Sgt. E. H. Winzar.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. Allot; L.A/C. F. H. Reed; Flt. Sgt. H. O. Westmorland.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. D. M. Griffiths; F/O. F. J. Reid; Flt. Lt. E. A. Snow.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. W. Andrew; L.A/C. D. M. F. Davis; Cpl. C. L. Hardwick; Sgt. E. S. Lawes; Sgt. S. J. Prosser; Flt. Lt. K. M. Turner; Sgt. R. A. Williams.

DIED ON ACTIVE SERVICE.—A/C.2 J. L. Crook; L.A/C. A. W. Foster; A/C.2 J. W. Jelfs; Flt. Lt. A. P. Jervis; L.A/C. W. A. Kirk; Flt. Lt. I. Mazure; L.A/C. J. O. Overend; L.A/C. W. G. Reilly; L.A/C. H. Rodgers; Cpl. J. H. Waterman.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. K. S. F. Dossett; F/O. A. Griffiths; F/O. G. H. Packham; Flt. Lt. J. S. Slaney; Sqn. Ldr. C. Wright, A.F.C.

ILLUSTRIOUS BOMBER : A Grumman Avenger being bombed-up on the flight deck of H.M.S. *Illustrious* for a raid on Japanese oil refineries.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—Cpl. E. S. Brown.

Royal Australian Air Force

KILLED IN ACTION.—F/O. H. J. S. Cargill; F/O. J. M. Levey.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O G. A. Hampton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. G. P. Beattie; Flt. Sgt. G. Brougham; Flt. Sgt. W. C. Butler; P/O. G. Ely; Flt. Sgt. T. W. Hennessy; F/O. J. R. Hutchins; W/O. K. A. Jolley, D.F.C.; Flt. Sgt. J. G. King; P/O. R. E. Llewellyn; Flt. Sgt. E. S. Newell; Flt. Sgt. J. A. Noske; Flt. Sgt. A. B. Pearson; Flt. Sgt. L. F. Peel; F/O. J. Poole; Flt. Sgt. K. McD. Radley; P/O. R. Rogers; P/O. W. C. Trewern; P/O. J. W. Tylor; Flt. Sgt. A. E. Unwin; Flt. Sgt. K. W. Ward; Flt. Sgt. L. C. Williamson.

WOUNDED OR INJURED IN ACTION.—Flt. Lt. R. E. Anderson; P/O. L. V. A. Burgis.

MISSING.—F/O. S. J. Bethel; Sqn. Ldr. J. Clark, D.F.C., A.F.C.; F/O. M. R. Delaney; F/O. P. E. Edwards; P/O. A. D. Morrison; P/O. D. R. Patterson; F/O. B. C. Reid, D.F.C.; W/O. R. Richards; F/O. J. M Scott, D.F.M.

KILLED ON ACTIVE SERVICE.—F/O. L. J. Draheim; F/O. N. G. George; W/O. F. H. Hardman.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. J. J. P. M. Bedard; Flt. Lt. J. McA. Brodie; Sqn. Ldr. L. H. Cameron; F/O. F. L. Chalmers; P/O. K. G. Cummings; Flt. Lt. H. McC. Hudson; F/O. D. J. Jackson; P/O. D. C. MacDougall; W/O. H. R. McKay; P/O. W. F. Russell; F/O. W. G. Tillmann; F/O. W. Uyen.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. S. Baldwin; W/O. W. R. K. Boles; Sgt. L. A. Carr; F/O. A. E. Clarke; Sgt. P. D. Cleal; W/O. F. W. Crossley; W/O. N. S. Davidson; P/O. J. L. Dissing; P/O. M. G. E. Donoghue; P/O. E. Dramnitzki; Flt. Lt. T. E. Dubroy; Flt. Sgt. W. R. Farrell; F/O. M. Gennis; P/O. W. A. Glover; F/O. J. M. Grieve; F/O. W. S. Johnson; F/O. W. S. Johnston; P/O. R. A. Kerr; P/O. F. G. Langford; Flt. Sgt. J. R. Martin; Flt. Sgt. D. W. Milliken; Flt. Lt. J. F. Munro, D.F.C.; W/O. J. B. D. O'Grady; Flt. Sgt. R. Pettitt; F/O. L. Plishka; Flt. Sgt. A. B. Radbourne; F/O. J. A. Robertson; Sgt. J. R. A. Ruthven; Flt. Sgt. K. W. Sawyer; W/O. S. G. Stephenson; F/O. R. H. Strauss; Flt. Sgt. R. C. Strickland; F/O. W. H. Timmins; Flt. Sgt. S. R. Troman; F/O. D. N. Turner; P/O. A. H. Waite; Flt. Sgt. A. R. Williams; F/O. F. W. Winter; Sgt. M. L. Wiper.

MISSING.—P/O. G. R. Bullion; F/O. A. K. Deakin; Flt. Lt. C. A. Lambert; P/O. E. B. Rosa.

KILLED ON ACTIVE SERVICE.—Flt. Lt. H. L. Flynn; Sqn. Ldr. R. M. Mace.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. H. K. McAvity.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. G. B. Mould.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. W. J. Morrison; F/O. T. D. Wardlaw.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. A. L. Merkley; P/O. J. B. Morison; Flt. Lt. J. Stoyko.

Royal New Zealand Air Force

KILLED IN ACTION.—F/O. N. S. Culpan.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. L. Cato; Flt. Lt. J. H. Christiansen; Flt. Sgt. J. R. Garbutt; Flt. Sgt. M. M. Hamilton; F/O. M. G. Hutchinson; P/O. A. P. Jenkins; Flt. Sgt. K. McG. Neilson; Flt. Sgt. C. R. Parkinson.

MISSING.—Flt. Lt. N. P. Whaley, D.F.C.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Lt. D. M. Garrter.

MISSING.—Lt. G. E. Millborrow; Lt. K. E. Ribbink; Lt. D. H. Taylor; Lt. J. W. M. Treu.

DIED ON ACTIVE SERVICE.—Cpl. R. F. Goldstone.

Casualty Communiqué No. 496

Of this list, 197 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—L.A/C. C. J. Andrews; Sgt. J. Capon; Sgt. A. J. Frisby; Sgt. L. W. W. Hooper; Sgt. W. H. Horton; F/O. J. M. P. Gourley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. R. Adams; W/O. C. Baxter, D.F.M.; P/O. L. J. Baker; Sgt. J. E. Bawtree; P/O. E. J. Brittain; Sgt. L. H. Broad; Sgt. D. A. Chaston; F/O. W. A. L. Colhoun; Sgt. K. Ellam; Sgt. R. W. England; Flt. Sgt. R. K. Y. Fairbairn; Sgt. W. Fox; F/O. H. C. Frost; W/O. V. Gardner, D.F.M.; F/O. W. G. Grant; F/O. G. Hallows; F/O. D. R. Inskip; F/O. J. McKee; Sgt. N. R. Pike; Sgt. W. A. Simmons.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. McG. Aitken; Sgt. J. M. Allan; Sgt. L. Ashton; Sgt. W. G. Atkins; Sgt. V. G. Baker; Sgt. W. Barratt; P/O. J. P. Bassett; F/O. H. J. Billington; F/O. R. J. Blake; Sgt. H. W. Bloomfield; Sgt. J. S. Bolton; Sgt. R. J. A. Boon; Sgt. J. B. Bowen; F/O. H. Bowling; Sgt. J. Brear; F/O. P. U. Brooke; Flt. Sgt. E. W. Brookes; Sgt. F. C. Brown; Flt. Sgt. M. G. Brown; Sgt. E. J. Cave; Sgt. P. P. Clarkin; Flt. Sgt. T. R. Clayton; Flt. Sgt. T. C. Climpson; Flt. Sgt. N. Cottrell; Sgt. L. Coughlan; Sgt. R. S. W. Cowdrey; P/O. J. A. Crabtree; F/O. G. A. A. Croskell; Sgt. A. H. Daines; Sgt. R. T. Davies; Sgt. E. J. Devine; Flt. Sgt. H. Dolby; F/O. L. Durham; Sgt. T. W. Durie; Flt. Sgt. P. Ellenbogen; Sgt. A. E. Elliott; Sgt. K. Emeny; F/O. E. C. Espley; Flt. Sgt. R. B. Fennell; Flt. Sgt. L. P. Fidgin; Flt. Sgt. W. B. Fothergill; F/O. C. H. Glossop; Sgt. J. Grant; Sgt. J. R. Grantham; Flt. Sgt. W. A. Guy; Sgt. I. R. F. Haberfield; Sgt. J. Hamilton; Sgt. R. A. Hart; Flt. Sgt. G. A. Hassett; Sgt. E. H. Hastie; F/O. E. G. Hawpins; Sgt. F. Helm; Flt. Sgt. J. A. Heldreth; P/O. H. B. Hill; Sgt. R. Hillier; F/O. E. Hone, D.F.C.; Sgt. H. P. Hopkins; Sgt. J. R. Jackson; Flt. Sgt. N. Jennings; F/O. A. G. G. Johnson; Flt. Sgt. R. Johnson; Flt. Sgt. A. P. Jones; Flt. Sgt. H. D. Jones; Flt. Sgt. A. H. J. Jordan; Sgt. H. C. M. Kahler; Sgt. F. Kasher; Sgt. E. MacD. Keep; Sgt. T. King, D.F.M.; Flt. Sgt. H. Lacey; Sgt. A. Landen; Sgt. J. J. Lapes; Sgt. H. R. Lawrence; Sgt. E. A. Lodge; Sgt. D. G. J. Lucas; Sgt. W. A. McCauley; Sgt. J. McGhie; Sgt. H. McGiffen; Sqn. Ldr. J. W. E. D. McGilvray; Flt. Sgt. F. Martin; Flt. Sgt. R. L. Mason; Sgt. D. Maughan; Sgt. B. H. Menary; Flt. Sgt. K. S. Milford; F/O. D. F. Minns; Sgt. J. T. A. Mitchell; Sgt. F. Mitchell; Sgt. E. J. P. Monk; W/O. A. A. Munro, D.F.M.; Sgt. G. H. Norton; Sgt. F. B. Patey; Flt. Sgt. P. Keenan; Flt. Sgt. M. C. Patterson; W/O. G. Peasgood; Sgt. C. A. Ponder; Sgt. A. C. Pope; P/O. J. L. Pritchard; F/O. N. R. G. Pronger; F/O. M. O. Rees; F/O. G. M. Reid; Sgt. R. Richards; Flt. Sgt. S. J. Richards; Sgt. G. G. Ridyard; Sgt. T. J. Rogers; Sgt. R. B. Russell; Sgt. P. F. Searle; Sgt. A. J. Sims; F/O. N. A. Smith; Sgt. E. H. Stedman; Sgt. D. Stewart; Flt. Lt. V. H. Surplice, D.F.C.; Sgt. R. Thomson; Sgt. A. A. Timson; Sgt. J. Tye; Flt. Sgt. G. Walker; Sgt. L. G. Washer; P/O. S. E. Watchorn; Sgt. L. G. W. Watts; Sgt. E. S. Weatherill; Sgt. L. F. Webb; Sgt. T. Whiteley; Sgt. W. E. Whitfield; /O. B. E. R. Whitehouse; Sgt. F. Wilson; Sgt. P. Woollam; Sgt. H. A. Wright.

WOUNDED OR INJURED IN ACTION.—Sgt. R. E. Austin; Sgt. J. E. Churchill; Sgt. J. Duffie.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. J. W. Chirnside; Sgt. R. Kearney.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. L. N. Collins; Flt. Lt. E. Gibbons; F/O. R. H. Hurn.

MISSING.—F/O. R. C. Amey, D.F.C.; Flt. Lt. C. A. Banks; F/O. E. Barratt; Flt. Sgt. A. Berry; P/O. F. G. S. Best; Sgt. G. M. Clark; Sgt. M. J. Cook; Sgt. R. E. B. Day; F/O. K. J. Dorricott; Sgt. J. F. W. Emerson; F/O. J. R. Garling; Sgt. P. E. Green; Flt. Lt. K. J. Harries; Sgt. J. Hodges; Flt. Sgt. W. Hughes; Sgt. L. Hunt; Flt Sgt. L. Jackson; Flt. Sgt. J. W. F. Jordan; Flt. Sgt. D. R. Kennedy; Flt. Lt. J. Kennedy; Flt. Sgt. J. Kenworthy; Flt. Sgt. G. W. Lane, D.F.M.; Sgt. G. L. Mitchell; P/O. E. C. Peek; Flt. Lt. R. F. Plant; Sgt. B. Poole; Sgt. A. R. Powell; Sgt. D. W. Roberts; Sgt. R. D. Roberts; Flt. Sgt. S. W. C. Roiman; F/O. F. W. Rolls; Sgt. D. C. Scott; Sgt. R. Shackleton; Sgt. W. N. Stevenson; Flt. Sgt. P. Taylor; W/O. A. Thomason; Flt. Sgt. E. G. Towle; Sgt. A. Tweddle; Sgt. R. H. Webb; Flt. Lt. J. D. White; P/O. R. S. Winton; P/O. A. E. Wykes.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Cpl. D. Wood.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. H. V. Ames; F/O. A. R. Ayton; W/O. A. W. Bannier; Sgt. A. A. Bell; Flt. Lt. G. M. Carmichael; A/C.1 J. B. Cockayne; Sgt. J. Duffin; Sgt. C. F. Farley; Sgt. J. Foster; Sgt. P. A. Gladhill; Flt. Sgt. D. W. Harris; Sgt. J. W. Hutton; F/O. W. L. Johnston; Sgt. W. J. Lawrence; Sgt. F. A. Oxlade; A/C.2 A. R. Parker; F/O. D. E. Parsons; W/O. J. Pattinson; Sgt. L. A. R. Potter; A/C.2 J. Pryor; A/C.2 F. E. Sorgatz; Flt. Sgt. E. J. Sweeting; Sgt. C. Symonds; Flt. Sgt. G. R. T. Taylor; Flt. Lt. F. G. N. Thomson, D.F.C.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. B. B. Gateley; Sgt. H. L. Regan; F/O. D. J. Simon; L.A/C. J. A. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. R. W. Murphy; P/O. H. J. Rich.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW REPORTED KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. A. Gebbie.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. V. J. C. Miles, D.F.C.; L.A/C. R. R. Ramsay; F/O. W. Rumbold.

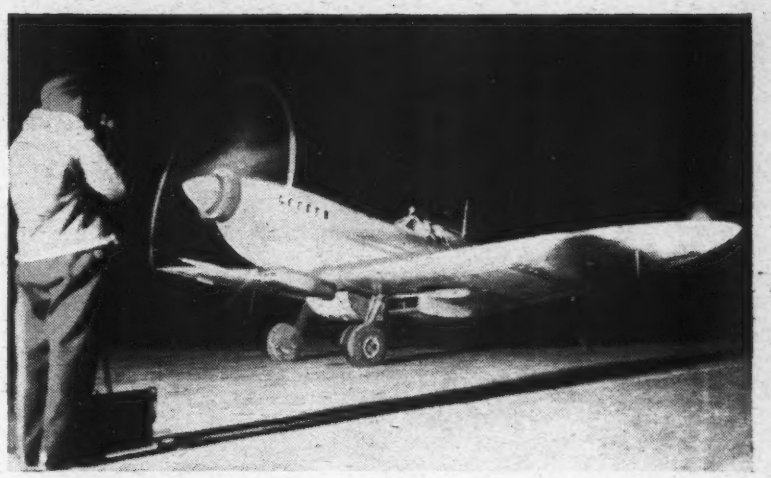
DIED ON ACTIVE SERVICE.—A/C.2 E. J. Dalton; L.A/C. J. Doyle; L.A/C. J. Hart; L.A/C. R. A. Heath; Cpl. A. C. Osborne; Sgt. R. J. Palmer; L.A/C. E. R. F. Reynolds.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. R. Armstrong; F/O. J. Cordner; Flt. Sgt. J. Gascoigne; Sgt. C. A. Glew; Flt. Lt. D. R. Hall; Sgt. A. Madelaine; W/O. L. Tidbury; Flt. Sgt. W. C. F. Wastell.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. I. F. Macrae.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. T. R. B. Anderson; Flt. Sgt. C. Billett; F/O. H. A. Brown; P/O. R. W. Burke; Flt. Sgt. L. H. Chapman; F/O. P. A. Crosby; P/O. E. A. J. Giles; F/O. K. J. Moses.



GETTING THE GREEN: A Spitfire IX of 2nd T.A.F. Meteorological Flight gets permission from control to take-off for a pre-dawn flight. This is the only "Met." flight to be based on the Continent.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. W. Batten; P/O. F. A. Connolly; Flt. Sgt. D. G. Duncombe; Flt. Sgt. W. P. Harrison; F/O. C. C. Heathcote; P/O. T. E. B. Kyle; Flt. Sgt. J. Lambert; P/O. J. H. D. MacDonnell; Flt. Sgt. P. A. Marsh; Flt. Sgt. E. D. Moncrieff; Flt. Sgt. A. J. Neeson; Flt. Sgt. R. M. Oakes; W/O. O. H. N. Shepherd; P/O. D. W. Story; Flt. Sgt. A. J. White; Flt. Sgt. G. Woolf.

MISSING.—Flt. Sgt. C. P. Calvert; P/O. T. H. Cambridge; Flt. Sgt. R. G. Cornwell; W/O. D. W. Jones; Flt. Sgt. D. W. McCray; F/O. J. H. McNamara; F/O. J. J. Wilson, A.F.M.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. P. A. Ewins; P/O. H. W. Harler.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. T. J. Lynch; Flt. Sgt. K. W. Manson; F/O. R. C. Watts, D.F.C.

Royal Canadian Air Force

WOUNDED OR INJURED IN ACTION.—F/O. C. E. Lynde; Flt. Sgt. B. L. McKinnon.

MISSING, BELIEVED KILLED IN ACTION.—P/O. R. F. Breen; F/O. C. F. Harwood; Flt. Lt. H. A. Ivens; Flt. Lt. L. A. Unwin; F/O. D. J. Washburn.

MISSING.—Sgt. W. B. Allan; F/O. H. D. Biggs; Flt. Sgt. J. A. Chiasson; Flt. Sgt. G. R. A. D'Amour; F/O. H. D. Davy; P/O. J. F. Devitt; F/O. W. H. Dunwoodie; Flt. Lt. W. L. Friker; F/O. R. W. Hale; P/O. B. E. W. Hall; F/O. D. G. Kellar; Flt. Sgt. J. C. H. Mathieu; Flt. Sgt. J. R. Patterson; P/O. J. V. Ranson; F/O. D. B. Robertson; Flt. Sgt. J. B. Rynski; W/O. J. D. Smith; F/O. J. Tite; Flt. Sgt. D. C. Tonkin.

KILLED ON ACTIVE SERVICE.—Sgt. C. E. Anderson; F/O. V. J. Bouchard; F/O. G. B. E. Forbes; Sqn. Ldr. S. J. Fulton; Sgt. S. S. Galvin; Flt. Lt. P. A. C. Maeder; Flt. Lt. W. F. Scott; Sgt. J. C. Smart.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. R. Seefried; L.A/C. E. Wahlers.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—W/O. G. P. Columbus; Flt. Lt. W. G. Dudley; P/O. J. F. L. Perry.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. H. H. W. Anderson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. H. Baird; F/O. J. L. Funnell; P/O. G. D. Heathcote; F/O. H. J. Rurray.

MISSING.—Flt. Lt. B. M. Madden; F/O. R. C. Veitch.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. T. G. Jacobs.

South African Air Force

KILLED IN ACTION.—2nd Lt. Stork.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—2nd Lt. B. Keyter; 2nd Lt. E. G. B. Stewart.

Casualty Communiqué No. 497

Of this list, 207 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. L. W. Beer; W/O. F. J. Bell; Flt. Lt. A. J. Booker; Flt. Lt. N. Brown; Sgt. A. S. Fleming; W/O. R. F. Goodman; Sqn. Ldr. L. Hatcher, D.F.C., A.F.M.; Flt. Lt. W. McK. Hodgson; F/O. G. S. Lawson; P/O.

SERVICE AVIATION

EMPIRE AIR ARMAMENT SCHOOL: A line-up of aircraft used for instruction. L. to R. Two Master IIs, Anson, Moth Minor, Lancaster, Proctor, Magister, Wellington, Hurricane and Spitfire IX.

E. Marron; Flt. Sgt. H. J. Naldrett; Flt. Sgt. J. Nichol; F/O. T. A. Priddle; Flt. Lt. C. Summerscales; F/O. A. J. Walker; Sgt. E. A. White; F/O. R. B. Yates.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. F. Abel; Flt. Sgt. J. Anderson; F/O. P. R. Bales; Sgt. J. D. Barker; Flt. Sgt. A. J. Barnett; Sgt. K. W. J. Baxter; Sgt. R. C. Betts; P/O. H. E. Borrow; Sgt. R. A. Boyden; Sgt. J. Bremner; Sgt. F. Buchan; W/O. W. V. Butler; Flt. Sgt. A. Caile; P/O. E. A. Church; Sgt. R. Cedling; Sgt. L. Collins; Sgt. F. Cottee; Sgt. T. B. Cowley; Sgt. L. G. Driver; Sgt. D. C. Duggan; P/O. R. W. Elliott; Sgt R. S. Eminsang; Sgt. W. J. T. Finch; F/O. K. A. M. Foottit; Sgt. D. G. Forster; Sgt. L. T. Gardiner; Sgt. W. Good; Sgt. W. J. Gowdy; Sgt G. E. Grigg; Flt. Sgt. J. E. Hands; F/O. D. F. Henshaw; Flt. Sgt. E. Hie; Flt. Sgt. R. F. Holborow; Sqn. Ldr. J. J. Jagger, D.F.C.; Sgt. S. R. Jessamy; Sgt. J. R. Keenen; F/O. D. H. Kent; P/O. G. R. Ketcher; Sgt. H. Landau; Flt. Sgt. E. A. Lane; Sgt. E. S. Lowe; Sgt. J. Lynch; Sgt. A. C G. Merces; Sgt. D. C. Mirams; Sgt. F. Mosley; Flt. Sgt. R. J. O'Connell; Sgt. E. E. Olive; Sgt. J. H. Paul; Flt. Sgt. W. Percival; Sgt. E. J. Pitman; Sgt. R. Prankett; Sgt. A. Pratt; P/O. C. Rankin; P/O. J. M. Read; Flt. Sgt. E. P. Reilly; Sgt. A. M. Roberts; Sgt. J. Rose; Flt. Lt. J. Ruddick; Sgt. J. W. Shelton; Sgt. C. E. Smith; W/O. R. Stanners; Sgt. J. R. Starr; Sgt. D. H. Stephens; Sgt. J. A. Swingler; Sgt. R. Symcox; P/O. J. K. Williams; F/O. H. Wyatt; Sgt. R. A. Yale.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. G. Cooke; Flt. Lt. M. F. Ingmire; Sgt. F. L. Tilley.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. V. S. Willis.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. E. J. D. Butler; Sgt. C. E. Dunlop; F/O. D. H. Edwards; Sgt. J. B. Gascoigne; Sgt. L. Hands; Sgt. D. R. John; Sgt. K. Punyer.

MISSING.—Sgt. P. K. Ashcroft; W/O. K. Baird; Sgt. R. W. Baker; Sgt. G. E. Barsby; Sgt. L. G. Blatchford; Sgt. E. Bone; F/O. F. J. Booth; P/O. F. O Booth; F/O. A. R. Caseley; Sgt. J. B. Clayton; Flt. Sgt. P. G. Cullen; Flt. Lt. J. G. Faulkner; P/O. N. I. Freakley; Sgt. W. A. Gamble; P/O. K. W. Hewitt, D.F.M.; Flt. Lt. R. C. Hockly, D.F.M.; Sgt. A. N. E. Holland; Sgt. R. H. Holliday; F/O. K. A. I. Hunt; Sgt. W. D. Lamb; Sgt. D. Lunn; Flt. Lt. R. H. McGowan; Sgt. K. S. M. Miller; Sgt. T. D. Mitchell; Flt. Lt. G D T. Nairn; Sgt. C. A. Nixon; Flt. Sgt. P. A. J. Offord; Flt. Sgt. G. Parkes; F/O H. E. Parratt, D.F.M.; L.A/C. S. T. Poile; L.A/C. G. S. Price; L.A/C. L. F. Relph; Sgt. D. E. Rodda; Sgt. T. A. Rodgers; Sgt. J. G. Sherburn; Flt. Sgt. R K. Shirley; Flt. Sgt. G. Stewart; Sgt. N. Summers; Sgt. A. Sutcliffe; Cpl. D. Townsend; F/O E. A. Underwood; F/O. O. S. Watson; L.A/C. J. Webdale; Flt. Sgt. R. F. Whateley Knight; Flt. Lt. G. B. White; Sgt. L. White; Flt. Sgt. J. S. Winter; E/O. W. H. Witherden; Sgt. H. McK. Yeardley.

KILLED ON ACTIVE SERVICE.—W/O. J. Cromarty; Sgt. J. F. Cromarty; F/O. R. G. Goldman; F/O H. A. Hartland; Sgt. P. H. Reynolds; Flt. Lt F. R. Riley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sqn. Ldr. C. N. B. Crisp.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. J. F. Clare; L.A/C. J. P. Johnson; Sgt. N. Wilson.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. N. O. Broad; Sgt. W. R. Edwards; F/O. A. H. Ingram; P/O. C. G. Neck; F/O. L. Nelson.

DIED ON ACTIVE SERVICE.—L.A/C. R. K. Banks; Flt. Lt. S. D. Barbour; L.A/C. K. J. Benn; F/O D. Braithwaite; L.A/C. R. Carrick; A/C.1 R. Clarke; L.A/C. K. Copson; Sgt. R. L. Craik; Cpl. M. Greavy; Flt. Sgt. W. F. Green; Cpl. F. T. Hasson; F/O. J. Kay; Cpl. S. H. Kemp; L.A/C. J. Kerslake; Cpl. R. MacLeod; Cpl. B. A. Nettle; L.A/C. E. Shepherd; A/C.2 T. Snee; L.A/C. C. R. Tasker; F/O. F. J. Webb; Flt. Lt. A. V. White.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. L. Benson; Sgt. J. S. Jenkins; Flt. Sgt. H. E. Yorke.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. R. Harvey

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. W. D. Blackwell; Flt. Sgt. A. H. Boettcher; Flt. Sgt. R. H. Keating; Flt. Sgt. J. Mudie; P/O. P. L. Symonds; Flt. Sgt. W. D. Toohey; Flt. Sgt. H. M. Vellenoweth.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. F. Davis.

MISSING.—F/O. R. F. Feilberg; F/O. W. A. R. Hanson; W/O. J. W. M. Herbert; F/O. W. J. Little; F/O. D. I. McDonald; Flt. Sgt. C. O. J. Seafe; Flt. Sgt. B. H. Smith; F/O. K. Watts; F/O. A. Wood.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. D. M. Lee; P/O. G. E. McGrath.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. W. H. Hare; Sgt. R. Miller.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. M. A. Decloux.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. R. H. Adamson; P/O. M. W. H. Askey; P/O. W. L. Baker; F/O. A. S. Barclay; W/O. R. L. Baxter; Sgt. G. A. Beckett; W.O. T. J. Beechinor; P/O. R. L. Biers; P/O. R. A. Billings; F/O. D. C. Bissell; Sgt. D. A. Black; Sgt. W. J. Blakely; W/O. D. W. Bowell; Sgt. T. J. Brewer; Sgt. G. W. Briffett; Flt. Sgt. J. G. Brislan; P/O. J. B. Cameron; F/O. A. L. Clogg; Flt. Sgt. E. M. Cockin; P/O. N. E. Cook; Flt. Sgt. W. G. Crain; P/O. L. Curatolo; P/O. P. R. A. Dack; F/O. C. C. Darling; P/O. D. J. V. Dawson; P/O. C. L. Depper; P/O. T. W. Dodd; W/O. N. G. Dowler; P/O. J. A. Earle; Sgt. A. J. Emerson; F/O. W. J. Erly; F/O. H. P. Farr; Flt. Sgt. D. J. Gibson; F/O. I. G. Gillespie; P/O. L. D. Gosney; P/O. L. S. Gray; F/O. W. E. Hampton; P/O. L. L. H. Hansen; Flt. Sgt. C. L. Hartman; W/O. D. L. Heard; P/O. G. W. Henderson; F/O. H. F. Heninger; Flt. Lt. A. G. Hermitage; Flt. Sgt. L. W. Hicks; P/O. M. E. Hodgins; P/O. N. B. Hunt; F/O. R. B. Hutchison; W/O. L. MacC. Jackson; Flt. Sgt. J. R. Jones; P/O. L. W. W. Jones; P/O. H. F. Keiser; F/O. P. Kennedy; F/O. A. B. M. Ketterson; W/O. H. H. Kinghorn; P/O. P. Labach; F/O. F. E. Lampin; P/O. R. H. Larson; F/O. G. H. Lawson; F/O. L. F. Legace; W/O. B. J. Lobb; P/O. S. A. Loftson; W/O. I. M. Lowe; W/O. E. F. McAneeley; Sgt. D. S. McClelland; F/O. R. B. McClellan; W/O. D. A. McDonald; F/O. J. E. McGrath; Sgt. J. A. McKenna; F/O. G. L. McLaughlin; W/O. H. MacLennan; F/O. H. E. McRae; F/O. R. McSorley; Wing Cdr. A. N. Martin; F/O. J. L. Martin; Flt. Sgt. L. W. Mattins; Flt. Sgt. J. J. C Mercier; Flt. Sgt. C. P. Miller; W/O. W. P. Morris; Flt. Sgt. G. C. Mould; Sgt. M. G. Mulligan; Flt. Sgt. D. S. Mullin; F/O. C. L. Murray; Flt. Sgt. L. Offer; F/O. H. B. Pharis; F/O. C. A. Phelps; W/O. J. D. Pilkey; F/O. A. Pitkethly; Flt. Sgt. C. E. Quickfall; F/O. W. R. Reed; F/O. A J.. Salaba; F/O. J. H. Seymour; F/O. W. R. Sloan; F/O. D. I. Smith; F/O. E. W. Smith; Sgt N. Smith; Sgt. S. J. Smith; Sgt. S. S. Smith; F/O. J. A. Sneddon; Sgt. S. Sondergaard; Flt. Sgt. H. W. Spackman; Flt. Sgt. F. A. Spencer; W/O. N. Mack. Stewart; Flt. Sgt W. K. Sutherland; F/O. M. S. Taylor; F/O. E. H. Thomas; Flt. Sgt. B. Thomasberg; P/O. R. H. Thompson; Sgt. T. W. Thompson; W/O. D. A. Thomson; W/O. G. W. C. Toal; Flt. Lt. T. Trilsbeck, D.F.C.; W/O. G. P. White; W/O. J. A. Wilson; P/O. K. C. Wilson; F/O. W. S. Wilson; W/O. R. A. Young.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. M. J. MacLeod.

MISSING.—F/O. A. W. Heughan; F/O. W. Paterson; Flt. Lt. R. N. Perdue; F/O. H. L. Shepherd.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. W. E. Culcheth; F/O. C. Watson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. G. R. Adams; Sgt. W. R. Christian; Sqn. Ldr. C. W. L. Hulke: W/O. W. D. Kearney; F/O. D. E. Raymond.

DIED ON ACTIVE SERVICE.—Sgt. J. W. Fraser; Flt. Sgt. K. J. Shields.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. H. L. R. Richards; F/O. C. H. Wright.

WOUNDED OR INJURED IN ACTION.—F/O. A. S. Keogh.

MISSING.—F/O. G. W. Browne; Sqn. Ldr. A. H. Smith, D.F.C.

South African Air Force

KILLED IN ACTION.—Lt. M. Flynn; W/O. G. Goldman; Lt. P. Kippen; Lt. D. S. Martin.

MISSING, BELIEVED KILLED IN ACTION.—W/O. R. G. Fletcher; 2nd Lt. W. Muller; W/O. A. S. Putter

MISSING.—Capt. R. N. Day.

Official Corrections

Casualty Communiqué No. 486.

Under MISSING, delete Flt. Sgt. R. Alderson; Sgt. C. Allen; Sgt. D. N. Bommell; for Flt. Sgt. W. J. Hudson read W/O.; delete F/O. O. J. Mclinden; P/O. D. McL. Nimmo; F/O. R. C. Preston; Flt. Lt. P. G. Sinclair; Flt. Sgt. J. Stewart; Group Capt. C. T. Weir; P/O. R. Williams.

Under PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—For Sgt. H. Eckford read Flt. Sgt.

Casualty Communiqué No. 492.

Under "MISSING," delete F/O. W. Davidson; Sgt. J. G. Jonas; Sgt. J. A. E. Knowles; Sgt. J. A. Mitchell; Sgt. R. A. Massey-Shaw; F/O. M. G. Peel; Sgt. G. J. W. Saxby; F/O. F. W. Trench.

Under "PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR."—P/O. L. Collins should read F/O. L.; P/O. L. Ellis should read F/O. L.

Under "R.A.A.F. MISSING," delete F/O. J. Gates and Flt. Lt. N. L. Merrett.

Under "R.C.A.F. MISSING."—W/O. G. McC. Thicket should read P/O. G. McC.; delete F/O. T. A. Wilson.

Casualty Communiqué No. 493.

Under "PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—After the name of P/O J. D. Aspin add "D.F.M."

Under MISSING, delete W/O. A. S. Appleton; F/O. R. E. Hill; Sgt. R. Laird.

Under the same heading, Sgt. D. W. E. Buckman should read Flt. Sgt.

Under PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR, Sgt. A. Mantle should read Flt. Sgt.

Under R.N.Z.A.F. MISSING, delete F/O. W. A. Carson and F/O. W. A. Kelly.